ARMY DEPOT MAINTENANCE: MORE EFFECTIVE USE OF ORGANIC AND CONTRACTOR RESOURCES

Report AR803R1

June 1990

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Prepared pursuant to Department of Defense Contract MDA903-85-C-0139.

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UNCLASSIFIED

ITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

EPORT SECURITY CLASSIFICATION Inclassified	1b. RESTRICTIVE MARKINGS
ECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION / AVAILABILITY OF REPORT "A" Approved for public release; distribution unlimited.
ECLASSIFICATION / DOWNGRADING SCHEDULE	
RFORMING ORGANIZATION REPORT NUMBER(S) .MI-AR803R1	5. MONITORING ORGANIZATION REPORT NUMBER(S)
IAME OF PERFORMING ORGANIZATION ogistics Management Institute — 6b OFFICE SYMBOL *(If applicable)*	7a. NAME OF MONITORING ORGANIZATION
DDRESS *(City, State, and ZIP Code)* 6400 Goldsboro Road Bethesda, Maryland 20817-5886	7b. ADDRESS *(City, State, and ZIP Code)*
IAME OF FUNDING / SPONSORING ORGANIZATION HQDA ODCSLOG, DALO-RMZ — 8b. OFFICE SYMBOL *(if applicable)* DALO-RMZ	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER MDA903-85-C-[illegible]39
DDRESS *(City, State, and ZIP Code)* The Pentagon, Room 1E560 Washington, DC 20310	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO

TITLE *(Include Security Classification)*

Army Depot Maintenance: More Effective Use of Organic and Contractor Resources

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TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT *(Year, Month, Day)*	15. PAGE COUNT
Final	FROM _____ TO _____	1990, June 4	155

SUPPLEMENTARY NOTATION

COSATI CODES			18. SUBJECT TERMS *(Continue on reverse if necessary and identify by block number)*
FIELD	GROUP	SUB-GROUP	Depot Repair Programs, Depot Maintenance

ABSTRACT *(Continue on reverse if necessary and identify by block number)*

Depot maintenance support is a critical element of peacetime material readiness and combat sustainability. The Army uses its organic depot intenance system as a controlled source of technical capability in support of both peacetime operations and mobilization surge.

During the mid-1980s, the Army lost some of its organic maintenance workload and staffing and at the same time increased its reliance on nmercial sources for repair. While the Army has recently stemmed the decline in organic workload, it continued to underutilize organic repair ilities. Furthermore, as technology advances, forces are reduced, and operating tempo changes, depot maintenance requirements will decline. The my must improve its management of the depot maintenance process to maintain a viable organic capability.

This report recommends that the Army improve its methods for computing mobilization requirements, sizing organic capacity, assigning ponsibilities for source-of-repair decisions, and monitoring the transition from interim contractor support to organic support. Additionally, ommendations for developing more flexible contracting methods are discussed. With these improvements in place, the Army can reduce costs while intaining or improving readiness and sustainability.

DISTRIBUTION / AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION
NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE *(Include Area Code)* — 22c. OFFICE SYMBOL

DRM 1473, 84 MAR — 83 APR edition may be used until exhausted. All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE

UNCLASSIFIED

Executive Summary

ARMY DEPOT MAINTENANCE: MORE EFFECTIVE USE OF ORGANIC AND CONTRACTOR RESOURCES

Depot maintenance support for major weapon systems, equipment, and reparable components is a critical element of peacetime materiel readiness and combat sustainability. The Army uses its organic depot maintenance system as a controlled source of technical capability for repairing mission-essential equipment and components in support of peacetime operations and forming the basis of a surge capability in the event of total mobilization or some other national defense contingency.

During the mid-1980s, the Army lost some of its organic depot maintenance workload, staffing, and capacity and at the same time, increased its reliance on commercial sources of depot maintenance. While the Army recently stemmed the decline in organic depot workload and staffing, it continues to underutilize organic repair facilities. Furthermore, as technology advances, forces shrink, and operating tempos change, depot maintenance requirements will decline and the Army will need to improve its management of the depot maintenance process to maintain a viable organic capability. Specifically, the Army should improve its method for computing mobilization requirements and sizing organic capacity, for clearly assigning responsibilities for decisions on whether to repair an item under contract or at an organic depot, for monitoring the transition of systems and components from interim support to organic support, and for developing flexible contracting methods.

We recommend that the Deputy Chief of Staff for Logistics take the following actions to achieve those improvements:

- Use the integrated logistics support regulations to promulgate formal decision and transition responsibilities and procedures
- Strengthen the role of Headquarters, Army Materiel Command, in managing the depot maintenance program and in overseeing transition of systems from contractor to organic repair.

- Develop better policies and systems for computing valid mobilization maintenance requirements
- Restructure organic depot billets and capacity to match and balance essential peacetime and mobilization requirements
- Increase the use of indefinite delivery type contracts and decrease the use of service contracts for depot maintenance
- Develop and implement an automated contractor status reporting system
- Increase the number of unserviceable assets that customers return directly to contractors.

Implementation of these recommendations can reduce costs while maintaining or improving peacetime materiel readiness and combat sustainability. Moreover, with these changes in place, the Army will be able to maintain a strong organic depot maintenance capability by providing strong justification of its requirements.

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CHAPTER 1

OVERVIEW

INTRODUCTION

Depot maintenance support for major weapon systems and secondary items contributes significantly to the material readiness of the Army in peacetime and its ability to sustain combat operations. Depot maintenance workloads can be performed in Government-owned, Government-operated (GOGO) facilities, Government-owned, contractor-operated (GOCO) facilities, or contractor-owned, contractor-operated (COCO) facilities. The Army considers only GOGO facilities to be "organic."[1]

The Army, like the other Services, uses the organic depot maintenance system to ensure the availability of a controlled source of technical competence and resources. Those organic talents and resources permit effective and timely response to a mobilization, national defense contingency situations, and other emergency requirements.

Between 1985 and 1988, the Army increased its reliance on commercial contractors for depot maintenance support of weapon systems and secondary items. At the same time, organic workload, staffing, and capacity utilization decreased. The Army was concerned that if that trend continued, it would risk having an ineffective organic capability to support a war effort. In 1989, the Army reversed this trend; since then organic staffing has increased and contract expenditures have declined.

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[1]The OSD also considers GOCO facilities to be organic under the definition provided in DoD Directive (DoDD) 4151.1, *Use of Contractor and DoD Resources for Maintenance of Materiel*, 15 July 1982. That directive states that organic facilities are "Government owned or Government controlled."

STUDY OBJECTIVES

This study has two objectives:

- To evaluate the policies, criteria, and practices used in deciding whether to contract or use organic resources for repair, and to assess the effect of that decision on organic depot workloading, capacity utilization, and pricing
- To recommend measures to improve the effectiveness and efficiency of the depot maintenance contracting process for secondary items.

MAJOR ISSUES

In this study, we analyze three major depot-level source-of-repair issues: the organic/contractor maintenance decision process, the decline of organic workload, and the sizing of depot maintenance capacity. We also analyze three secondary item contracting process issues: contracting methods for depot maintenance, contracted maintenance information requirements, and the routing of unserviceable materiel to contractors.

In this chapter, we provide a synopsis of the major issues and recommendations related to organic/contractor sources-of-repair and the maintenance contracting process. Chapters 2 and 3 provide in-depth analyses of those two subjects, plus detailed conclusions and recommendations.

SOURCE-OF-REPAIR ISSUES

Discussion

Organic/Contractor Decision Process

In 1982, OSD directed the Services to develop and implement a "decision tree" for assigning source-of-repair responsibilities. The purpose was to help determine the minimum organic resources required in peacetime to support the mobilization requirement. In 1983, the Army developed a source-of-repair decision tree that was approved by OSD. The decision logic of that tree primarily directed mission-essential work to organic repair facilities without much detailed analysis. This was consistent with Army desires to maintain a strong organic capability to respond quickly and reliably to surge and mobilization requirements in a national emergency.

During this study, we discussed with many individuals involved in depot maintenance the risks involved in relying on contractors to perform depot

maintenance in CONUS facilities. Some valid concerns exist; concerns, for example, about competition between maintenance and production when the same facility supports both, and concerns about contractor performance in situations short of a declared national emergency. Such potential risks can be minimized, however, by putting surge clauses in contracts and, in some cases, giving preference in source selection to bidders offering dedicated repair facilities.

As we reviewed the decision logic for specific weapon systems, we found that actual decision policies and practices varied widely. Each individual decision was based upon a logical set of reasons; however, the collective result of these decisions was not in line with overall Army program goals for sustaining the organic base. No Army group or organization provides program-wide oversight and control. Although OSD approved the Army decision tree, it was never formally published or implemented.[2]

The recently published Army Regulation (AR) 750-2, *Army Materiel Maintenance, Wholesale Operations,* includes a revised version of the decision tree. We believe the decision tree omits important information. It does not address specific authorities, responsibilities, or coordination requirements. Nor does it stress the importance of interim contractor support (ICS) and transition planning. Furthermore, the Army should choose a better implementation vehicle than AR750-2, one such as AR700-127, Integrated Logistics Support, that addresses the responsibilities of the program executive officer/program manager (PEO/PM) for integrated logistics support.

Declining Organic Workload

In 1985, Army organic depot maintenance workload was at its peak with a work force of over 20,000 personnel. At that time, the organic facilities accomplished approximately 67 percent of the total depot maintenance workload. In 1989, the Army employed approximately 18,600 personnel[3] for organic depot maintenance,

[2]We did not review three decisions made at the Under Secretary of the Army level: Apache Avionics, Target Acquisition Designation Sight/Pilot Night Vision Sensor, and Mobile Subscriber Equipment. Decisions on these issues were reportedly based upon costs, and we were unable to obtain any detailed cost analyses.

[3]Includes career civil service plus temporary hires.

which accomplished approximately 61 percent of the total direct Army depot maintenance program.

Over time, the organic portion of the total program declined from 1984 through 1988, that decline was reversed in 1989, and organic workload is estimated to constitute 65 percent by 1991.

Figure 1-1 shows the funding levels for the organic and contracted direct Army depot maintenance programs. Although the graph shows that requirements have increased during the past few years, long-term planners predict an overall decline in depot maintenance requirements because of technology advances, force reductions, and operating tempo changes. New systems are more reliable than their predecessors and are being designed so that more components can be removed and replaced at levels below the depot, and this is likely to shift work from end-item overhaul to secondary-item repair. For those reasons, the Army's future maintenance workload will not require the current organic 18,600 man-years capability.

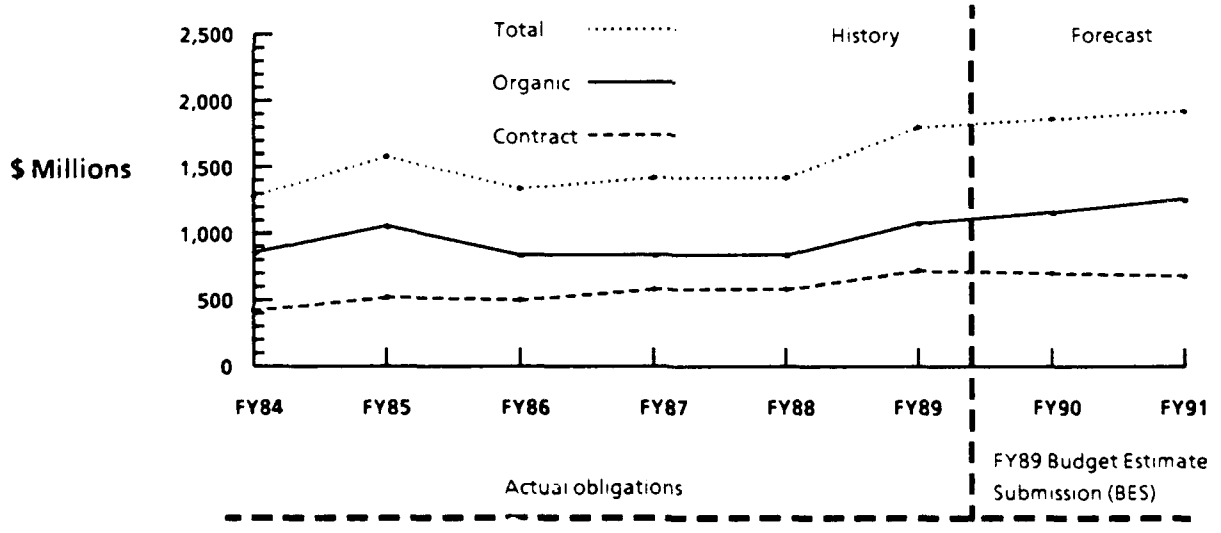

FIG. 1-1. WORKLOAD TRENDS, DIRECT ARMY DEPOT MAINTENANCE OBLIGATIONS

Many factors contributed to the decline in organic workload that took place between 1985 and 1988. The principal factor was a ceiling on Department of the Army civilian personnel strength. Other factors were the lack of a formalized decision process, increased use of streamlined and nondevelopmental item (NDI)

procurements requiring ICS, technology issues, and some inadequate ILS planning. Our research indicates that as of 1989, this trend has shifted and the program has reversed. Personnel restrictions have decreased and the newer systems are beginning to transition from ICS to organic maintenance. However, some of the factors that contributed to the decline need improving.

Sizing Depot Maintenance Capacity

Figure 1-2 shows that physical capacity of the Army's organic maintenance system has increased slightly over the years while workload has decreased by over 10 percent. In 1988, the depots operated at approximately 57 percent of their physical capacity.[4]

Even if the entire contract workload was transferred to the organic base, excess capacity would still exist.[5] This situation may change as a result of recent defense management review (DMR) initiatives.[6]

DoD policy is to fully utilize the one-shift capacity of depots in peacetime (including equipment down time, holidays, leave, and other administrative constraints). The only ways to increase utilization are to increase workloads, decrease capacity, or do both. Utilization rates can be changed on paper by recalculating physical capacity based upon only existent work positions. However, overall costs can be reduced only by reducing capacity. Closing a depot or removing entire buildings from service, for example, brings about significant reductions in capacity.

In part, the Army justifies its low utilization on the grounds that the idle capacity is needed for mobilization surge. Generally, DoD policy is to increase utilization during mobilization by expanding the workweek or instituting a second shift. Thus, if the Army were at 100 percent utilization today, it could still

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[4]The Depot Systems Command (DESCOM) was the source for capacity data. At the time this report was published, 1989 capacity data were not available.

[5]Contract workload was estimated from the organic workload and the 1989 funding ratio of 60.56 percent organic to 39.4 percent contract.

[6]The Army management review identified a potential reduction of depot maintenance facilities. The impact of those on-going considerations are not reflected in this report.

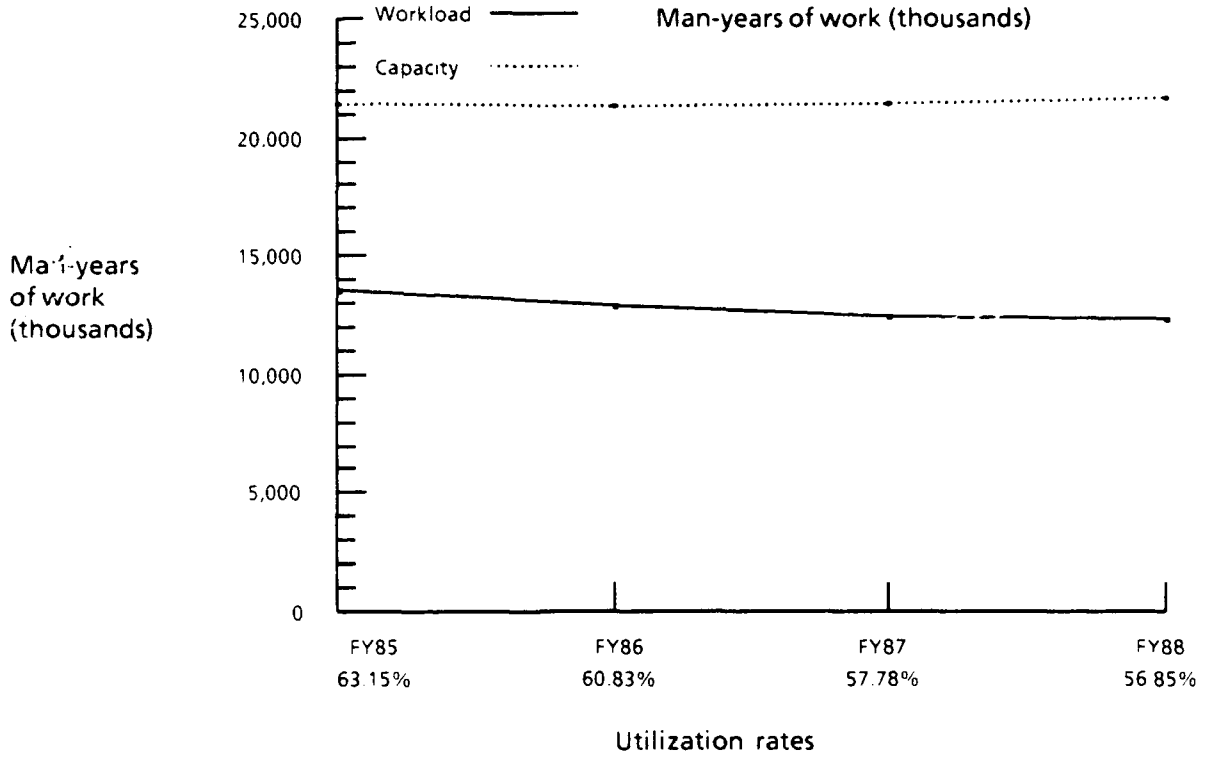

FIG. 1-2. ARMY DEPOT CAPACITY VERSUS WORKLOAD HISTORY

meet mobilization surge requirements of 180 to 250 percent over peacetime requirements.[7]

Our research indicates that Army-projected mobilization requirements used for posture planning are outdated and possibly greatly overstated. More than half the mobilization requirements on file at DESCOM have not been updated for at least 5 years. That deficiency is one of the many associated with Army mobilization planning for depot maintenance that are discussed in this report. Our analysis indicated that many items are not likely to surge as high as planned. Careful planning is required to size the depot facilities properly and establish their workloads so that they are neither underutilized in peacetime nor insufficient in wartime.

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[7]DoDD 4151.1 states that utilization in peacetime shall be planned to accomplish the equivalent of 100 percent of peacetime workload capacity on a 40-hour week, one-shift basis with the equivalent of an organic facility utilization of 185 percent physical capacity under mobilization. Individual shop utilization should be limited to 250 percent.

Before such planning can be done, the Army must determine its valid wartime requirements.

Recommendations

Insofar as source-of-repair is concerned, we recommend that the Army take the following steps:

- Modify and implement the decision tree through ILS regulations
- Increase the role of the Army Materiel Command (AMC) Headquarters in managing the overall depot maintenance program
- Require more thorough transition planning, coordination, and control between PMs and AMC
- Decrease wartime contracting risks through improved contracting methods
- Adjust billets, workload, and capacity at organic depots to match more closely future peacetime requirements
- Improve the depot maintenance mobilization forecasting program and use the results in a program to assess the required size of the organic base.

CONTRACTING PROCESS ISSUES

Discussion

Contracting Methods for Depot Maintenance

Two of the key elements in assessing the responsiveness of depot maintenance support are the flexibility of the process in dealing with changing materiel requirements and the length of leadtimes from requirements determination to induction of unserviceable assets into the repair process. Both elements require special consideration in the methods used to contract for secondary item depot maintenance.

The frequency and magnitude of the variance between the number of unserviceable returns forecast and the actual number of returns vividly demonstrates the need to utilize contract types that provide the Army with broad flexibility in specifying the quantity to be repaired.

We compared a 75-sample unserviceable return forecasts made by three National Inventory Control Points (NICPs) with the actual returns for the forecast

period of 1 year. Only 29 percent of the forecasts were within 25 percent of the actual number of returns. Fifty-five percent deviated by more than 50 percent.

Three of the NICPs extensively use definite quantity contracts (76 percent of the depot maintenance contracts). Because of the inability of the NICPs to accurately forecast the number of unserviceable returns, they accumulate unserviceable assets in many cases before awarding these contracts. The objective of that practice is to ensure the availability of unserviceable assets equal to the contract quantity so that the Government will not have to pay for work not performed. This practice requires a large investment in inventory if demands are to be satisfied. Definite quantity contracts also provide the least amount of flexibility to changing requirements.

Another contracting practice widely used at those NICPs and related to the forecast error is the use of time-and-material service contracts. That type of contract does not contain line-item-specific information even subsequent to the issuance of a contract modification with specific items and quantities. Usually those service contracts are based on "bulk" procurement request order numbers (PRONs), and neither the maintenance files nor the materiel management files have item-specific data on quantities and value. Without such data, processing through the parts explosion process to project the requirements for Government-furnished parts is not possible. Also, item-specific execution data during and after the execution year are not available for Army managers and cannot readily be submitted to OSD as required.

At one Army NICP, the extensive use of indefinite-delivery-type contracts resulted from its determination that such contract types are generally the most suitable and provide the necessary flexibility. The Air Force also makes extensive use of indefinite-delivery-type contracts for depot maintenance.

The administrative effort required to solicit and award contracts is extensive and costly, but the cost can be minimized through the use of multiyear contracts and contracts with optional follow-on years. In addition to minimizing the administrative effort required, those provisions make the solicitation more attractive to prospective contractors. The combination of the indefinite-delivery-type contract with multiyear provisions is especially well suited to contracting for secondary item depot maintenance.

Contracted Maintenance Information Requirements

The same basic status information is required for materiel being repaired by a contractor as for that being repaired organically. When the materiel is shipped to a contractor, additional steps are involved. Regulations require that Government-furnished material (GFM) be accounted for while in the hands of contractors; therefore, issues to, receipts from, and materiel in the hands of contractors must be reported and recorded.

For several reasons the required information is not always recorded in all of the appropriate computer files in a timely manner. Many documents (Forms 1348-1, 906, 926, and unique contractor forms) are required. The data are submitted on hard copies, requiring labor-intensive and error-prone transcribing and key entry. With the exception of Form 1348-1, the documents are usually required monthly and by the time the NICP receives and posts the information, it is from 10 to 40 days old. Currently, the transactions are posted only to the Requirements Determination and Execution System (RD&ES) (Materiel Management). Since they are not posted to either the Maintenance Data Management System (MDMS) (Maintenance) or to the Military Standard Contract Administration Procedures (MILSCAP) System (Procurement), the systems do not include the execution data they were designed to include. Therefore, the annual execution report that is submitted to OSD lacks most of the contract execution data.

The present NICP procedures for recording the shipment of unserviceable assets directly from the retail activity and establishing a "due in" to the contractor are more complex and require more manual intervention than necessary. Further, they do not provide the NICP with asset visibility until the shipment is received by the contractor.

The Navy has developed a contractor asset visibility system that provides the required status of contractor maintenance and asset information to its NICPs on a daily basis and eliminates much of the manual processing of hard-copy documents. That system, which may be of use to the Army, is based on Government-furnished software and computers with modems.

Routing of Unserviceable Materiel to Contractors

Most unserviceable returns from Army retail activities that are destined for contractor repair are shipped to a wholesale depot for receipt, storage, and subsequent reshipment to the contractor. The Army makes limited use of returning unserviceable assets directly to the maintenance contractor. (It does so primarily in cases of interim or life-cycle contractor repair.) The Air Force and the Navy, on the other hand, make extensive use of direct return, bypassing depot storage.

Except in exceptional circumstances, substantial savings can be realized by returning unserviceable assets directly to the maintenance contractor. The transportation costs for the single move from the retail activity to the contractor are less than the cost of the double shipment from retail to depot and depot to contractor. The total elapsed time from generation of the unserviceable asset to its induction into maintenance is also less, thus reducing the pipeline inventory investment. Bypassing the depot also saves an average of $40 per line item to receive and stow and $20 per line item to pick and pack for shipment.

Recommendations

We recommend the Army take the following steps to improve its secondary item depot maintenance contracting process:

- Increase the use of indefinite delivery type contracts with multiyear provisions and greatly reduce the use of service contracts
- Increase the use of multiyear provisions in contracts
- Revise AR 725-50 to permit requests for assignment of Department of Defense Activity Address Code (DoDAAC) prior to contract award
- Develop an automated contractor reporting system for timely asset and maintenance status reporting, and provide contractors with the necessary software and hardware
- Simplify and improve procedures for accounting for direct shipments of unserviceable assets to contractors
- Return unserviceable assets directly from retail activities to contractors under all favorable conditions.

REPORT FORMAT

Chapter 2 presents major findings, conclusions, and recommendations for source-of-repair issues. Chapter 3 does the same for contracting process issues. Appendix A identifies recommended revisions to relevant Army regulations. Appendix B presents a funding history and forecast of the Army depot maintenance program. Appendix C contains an analysis of maintenance data in the FY89 Maintenance Data Management System (MDMS) program. Appendix D identifies current Army mobilization planning program deficiencies. Appendix E contains case histories for the weapon systems evaluated during the course of this study. Appendix F presents our analysis of the Army and Air Force source-of-repair decision trees. Appendix G contains a detailed analysis of the contracting out process. Appendix H is a glossary of acronyms.

CHAPTER 2

DEPOT MAINTENANCE SOURCE OF REPAIR

INTRODUCTION

This chapter presents our major findings, conclusions, and recommendations. The detailed data and analyses are presented in Appendices A through F, which address the following key areas:

- The decline of the organic depot maintenance workload
- The sizing of organic depot maintenance capacity
- The process followed in deciding whether to use organic repair facilities or contract for the repair.

THE DECLINE OF ORGANIC DEPOT WORKLOAD

Background

In 1983, Congress passed legislation to remove civilian personnel ceilings to allow industrial fund activities to hire a work force commensurate with the workload. Between 1983 and 1985, Army depot maintenance personnel strengths increased to over 20,000, their highest level ever. At that time, the organic program represented approximately 67 percent of the total Army direct depot maintenance program funding.

Subsequently, the Army reduced its civilian organic work force to 17,919 in FY88. To compensate for this reduced capability, contract workload expenditures increased. Because of core-logistics and other congressional legislation, and the Army's decision to allow the organic work force to grow above the 17,919 ceiling, this trend has now been reversed.[1] However, long-term workload projections show the total workload requirement decreasing. It will be difficult to maintain the organic work force at present levels with the projected smaller total requirement.

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[1]Core-logistics legislation is discussed on page 2-7. Other congressional legislation is discussed on pages 2-8 and 2-9.

History of the Decline (1984 Through 1988)

Table 2-1 shows the 8-year history and projection of direct Army funding levels. The percentage of the total direct Army program assigned to contract resources increased from 32 percent in 1984 to a high of 41 percent in 1987 and 1988. During that period, organic workloads generally decreased (with the exception of 1985) while contract expenditures experienced real growth above inflation. The 1989 actual obligations and the projections for 1990 and 1991 show a reversal of that trend.

TABLE 2-1

DIRECT ARMY DEPOT MAINTENANCE BUDGETS

(History and projections)

Year	Millions of dollars			Percentage	
	Organic	Contract	Totals	Organic	Contract
1984	865	412	1,277	68	32
1985	1,065	520	1,585	67	33
1986	846	498	1,344	63	37
1987	843	584	1,427	59	41
1988	832	583	1,415	59	41
1989	1,082	728	1,810	60	40
1990[a]	1,169	697	1,866	63	37
1991[a]	1,257	672	1,929	65	35

[a] Projection from 1989 BES.

Source: Office of the Deputy Chief of Staff for Logistics (ODCSLOG) and AMC.

Maintenance Contracts

Maintenance contracts are generally divided into two categories: national maintenance contracts and GOCO facility contracts.[2] The commodity commands manage the national maintenance contracts while DESCOM manages the GOCOs in the same manner as the organic depots.

[2]There also are relatively small contracts awarded in Korea that are not GOCO contracts. The funds for those contracts are included in the GOCO category in this section.

Figure 2-1 shows the FY89 depot maintenance program totals taken from the MDMS for fo · major subordinate commands (MSC) analyzed. For these MSCs, approximately 51 percent of the total program is organic, 5 percent is performed by other DoD maintenance activities (inter-Service), 12 percent by GOCOs, and 31 percent is by national maintenance contracts. The Aviation Systems Command (AVSCOM) accounts for about 60 percent of the total national maintenance contract budget. The AVSCOM contracted portion is further displayed in the inset pie chart.

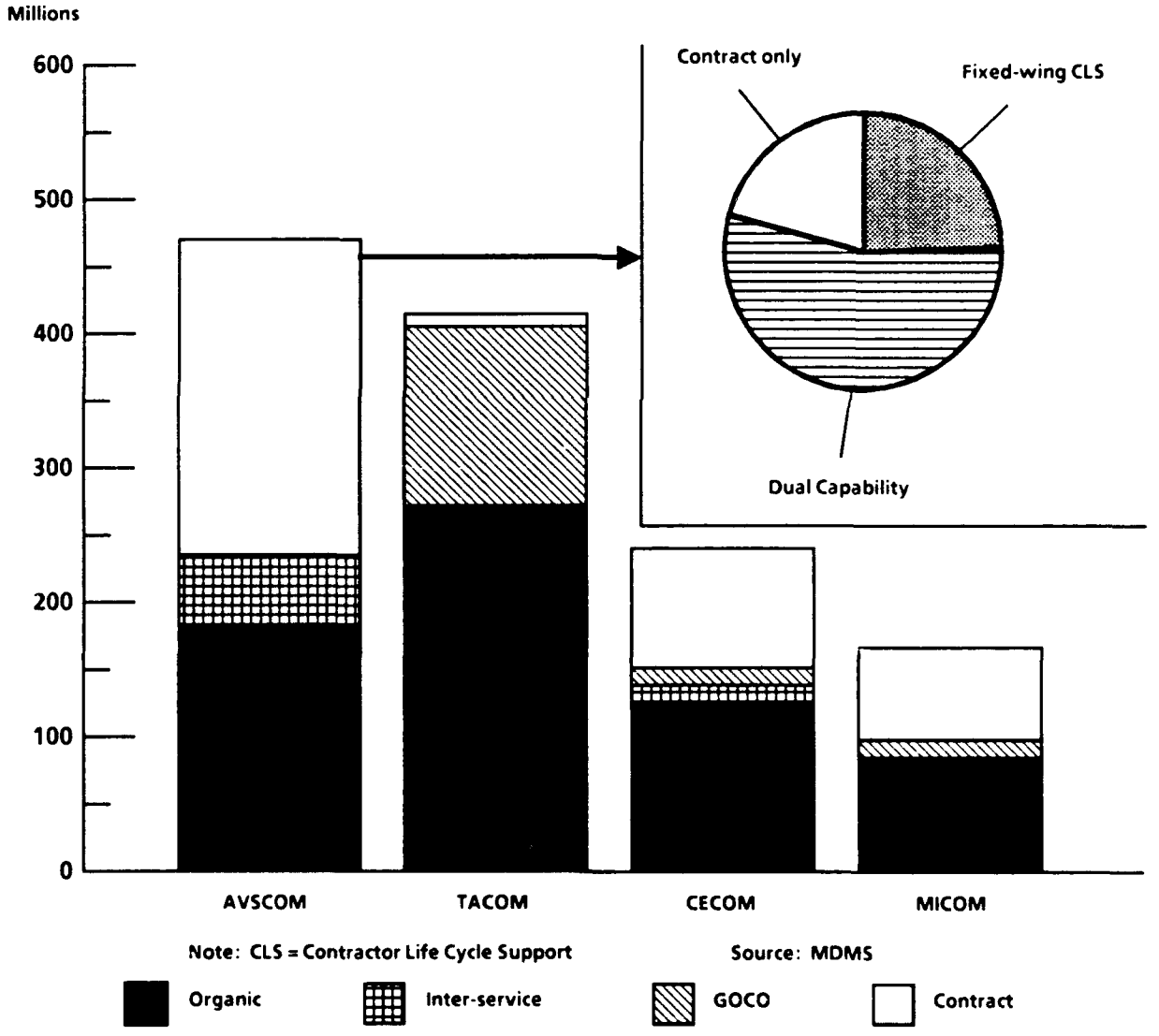

FIG. 2-1. 1989 DEPOT MAINTENANCE EXPENDITURES

The majority of AVSCOM's contract funding, about 55 percent, is for components that are maintained at both organic and contractor depots. The Army has only one organic aviation depot, and it has been operating at well below its capacity because of manpower limitations. At the same time, congressionally imposed personnel floors at the electronic depots prevent personnel redistribution.[3] The next largest portion, 31 percent, covers the fixed-wing aircraft under life-cycle contract repair programs. The remaining 14 percent are for items that are scheduled for transition to organic maintenance or have life-cycle contract support arrangements. Nearly all of the contracted items were coded as mission-essential. Conversely, nearly all of the items coded as nonessential were repaired organically.

The Tank and Automotive Command (TACOM) has almost no national maintenance contract programs. We could not analyze Missile Command (MICOM) and Communications and Electronics Command (CECOM) contract programs because of their heavy use of bulk PRONs for contract maintenance. Those are single PRONs, representing many individual items, that are not associated with specific national stock numbers (NSNs).[4]

Factors That Drove the Decline

This section discusses factors that influenced the historical decline in the organic depot workload.

Glidepath

In 1985, the Army decided to reduce its overall civilian strength. As part of that reduction, AMC began a program called "Glidepath" to reduce the level of depot maintenance personnel by 17 percent. The program sought to reduce personnel from 20,080 in FY85 to 16,623 by the end of 1988. Because of congressional pressures to maintain organic capability, the total reductions were not as great as originally planned, and a ceiling of 17,919 was established in FY88.[5] Since the maintenance

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[3]This is counter to other congressional concerns about the DoD managing personnel by "end strength." Managing by end strength has been prohibited for 1989 and 1990 by Public Law 100-456.

[4]Our method of stratifying workloads relied on NSN-specific data contained in the Army master catalog data file.

[5]The original ceiling was 18,137. It was revised to 17,919 when data-processing billets were transferred out of maintenance.

requirements were not reduced, much of the workload planned for organic facilities had to be contracted.

Floor on Personnel at Electronic Repair Depots

Special legislation enacted in 1986 exempted the three Army electronic repair depots from the Glidepath personnel reductions [(Tobyhanna, PA (TOAD); Sacramento, CA (SAAD); and Lexington-Bluegrass, KY LBAD)]. That legislation established personnel floors with little regard to planned or forecast electronic workloads. It removed the Army's flexibility to assign personnel billets to the commodity-oriented depots with the greatest workload requirements. It also created enormous pressure within the Army to provide enough electronic workload to effectively employ all of these workers. Had the Army been able to transfer personnel to Corpus Christi, TX (CCAD), to work on aviation components, AVSCOM may not have had to contract to the magnitude that they did.

New Procurement Methodologies

Both streamlined and nondevelopmental types of major system procurement decrease or eliminate the full-scale development phase, thus resulting in many early engineering changes that change the configuration rapidly. Because of design instability at the time a major system is first fielded, the technical data, tools, and equipment needed to establish organic repair capability are rarely available. Thus, the most practical course for planning depot repair is to rely on the contractor's production facilities until such time as a stable technical data package and test sets can be delivered and an organic capability established.

Streamlined and nondevelopmental procurement have been used heavily in recent years, especially at MICOM and CECOM. Although most of the systems will transition to organic depot repair eventually, their initial reliance on contractor repair results in a decline in organic depot use as these new systems replace older systems repaired organically. Our review of the latest Army workload forecast shows that many of these systems are scheduled for transition to organic depot repair in the near future.

Advanced Technology

Many modern major systems use advanced technologies that require specialized equipment and skills for repair. Those skills and equipment are not always available

at organic depots. Sometimes specialized equipment is needed, and it is rather costly, can be procured only after long leadtimes, or is not yet available. The following technology-related issues have contributed to the increased use of contractors.

- Systems designed to utilize the intermediate forward test equipment (IFTE) for depot repair cannot transition from contractor repair to organic depot repair until IFTE is available, possibly in 1992.
- The disapproval of requests for waiver to deviate from the requirement to use the standard automatic test equipment (ATE) has delayed the transition to organic depot support in the past.
- The procurement of test program sets (TPS) for use with ATE can be a very lengthy process.
- The use of contractor depot-level repair services "on site" for advanced electronic components has resulted in great customer satisfaction.

Insufficient ILS Planning

Some organic capabilities have not been established because of poor ILS planning and execution. Delays in achieving planned organic support have occurred for a variety of reasons, but many slips could have been reduced through better planning. The following are some examples we found for specific major systems:

- Because of vague contractual clauses in production contracts, proprietary right disputes occurred and delayed the delivery of the technical data needed to establish organic depot repair.
- The procurement of technical data was overlooked in the initial production contract.
- The maintenance concept for a system was changed radically after the technical data had already been procured.
- Necessary funding for data and equipment was delayed or eliminated.
- Failure of the Army to develop a depot maintenance support plan (DMSP) and transition plan resulted in lack of coordination between PM, National Maintenance Point (NMP), NICP, and DESCOM organizations.

Factors That Reversed the Decline

Table 2-1 shows that beginning in 1989, the trend toward increased reliance on contract maintenance was reversed. The 1989 organic program increased by $250 million or 30 percent over the 1988 program. The latest forecasts show that in

1991, 65 percent of all Army repair will be done in organic depots. This section discusses the factors that have caused that turnabout.

Core Logistics

Core logistics, first enacted in the DoD Authorization Act of 1985, prohibited contracting for depot maintenance functions that will be needed in times of emergency. According to OSD, core logistics capabilities are defined to be the facilities, equipment, and management personnel at DoD depot maintenance activities. The law permits work at those activities to be performed by either Government or contractor personnel, whichever is more cost effective.[6]

The exact meaning of the legislation has been widely interpreted. A report by the House Appropriations Committee (HAC) stated that the core logistics legislation prohibits the contracting for any essential depot repair workload. The OSD position is that the core logistics law prevents an entire depot from being subjected to a Commercial Activities (CA) cost study. These are radically different interpretations.

Although the core logistics law is vague, it has had a strong influence on the Army view of depot maintenance. Army decision tree logic attempts to assign all mission-essential workloads to organic sources, in part, because of the core logistics legislation.

Glidepath Reversed

As previously discussed, the Glidepath program end strength reductions were not as great as originally planned. In late 1987, the Army decided to treat the ceiling as a floor and is currently employing 18,600 career personnel and temporary employees.[7] Recently approximately 200 career personnel were hired at CCAD. Figure 2-2 shows the current personnel allocation by depot as compared with the personnel authorization.

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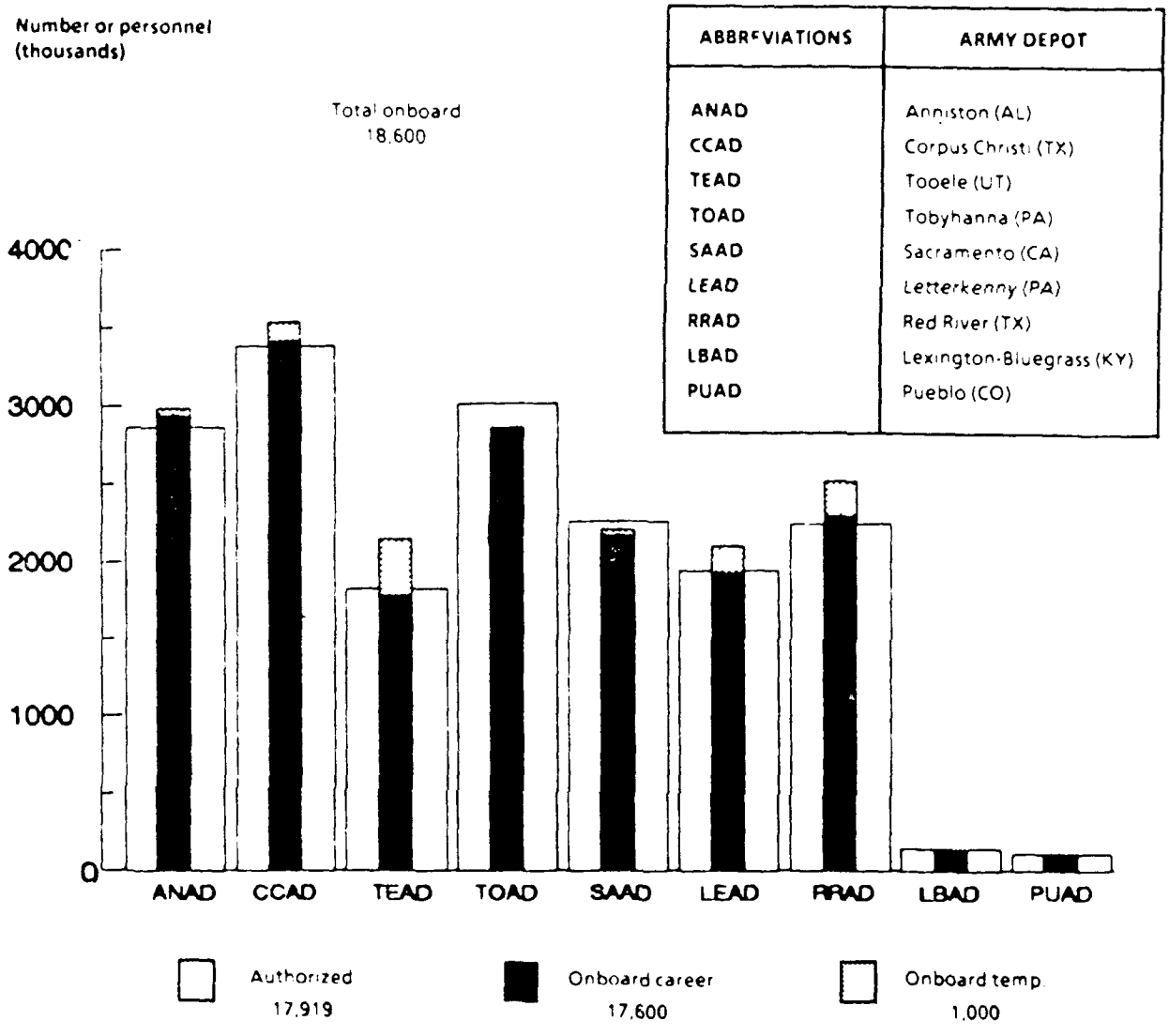
[6]Department of Defense Instructions (DoDI) 4100.33, *Operation of Commercial and Industrial Type Activities*, 25 February 1980.

[7]Memorandum for AMC from U.S. Army Deputy Chief of Staff for Logistics (DCSLOG). Subject: *Depot Maintenance*, 10 December 1987.



ABBREVIATIONS	ARMY DEPOT
ANAD	Anniston (AL)
CCAD	Corpus Christi (TX)
TEAD	Tooele (UT)
TOAD	Tobyhanna (PA)
SAAD	Sacramento (CA)
LEAD	Letterkenny (PA)
RRAD	Red River (TX)
LBAD	Lexington-Bluegrass (KY)
PUAD	Pueblo (CO)

FIG. 2-2. ARMY DEPOT PERSONNEL

Congressional 60 / 40 Policy

In the 1988 and 1989 Defense Authorization Acts, Congress inserted language that requires the Army to spend a minimum of 60 percent of the depot maintenance budget on programs performed by DoD's organic work force. The 60/40 division does not necessarily represent the best possible ratio.

A better approach would be to allow the percentage to vary from year to year based upon the current situation. Such things as the fielding schedule for systems under interim support, the transition of systems to organic support, the retirement of

older systems, etc., should be considered. Obviously, many newly introduced NDI type systems in a short period of time can have a significant effect on the organic/contractor mix.

Much internal Army management attention has been devoted to ensuring that the 60/40 split is achieved. That increased attention to organic/contractor ratios has led to several initiatives to decrease or eliminate the transition times for new systems. While the increased attention to transition planning is an excellent result, it must be noted that premature establishment of organic capability can be a costly mistake.

Cost Competitions Not Required

The 1989 Defense Authorization Act permanently prohibited the Secretary of Defense from requiring the Army to carry out depot maintenance source competitions between organic depots and contractors.[8] This legislation has helped reinforce the idea that maintaining the organic depot base is more important than economic considerations.

Interim Systems Transitions

Some of the major new systems that were placed in interim contract support will reach their transition dates in the next few years. These systems were scheduled for organic support but had to be supported by contractors until the systems stabilized and an organic capability was established

Budget Cuts Impacting Contracts

The majority of the decrements to the funded depot maintenance requirement that are necessary for 1990 and 1991 are planned to be taken from the contract portion of the budget. Thus, the percentage of repair done at organic depots will increase to nearly 65 percent by 1991.

Maintaining the Organic Base

Although the factors discussed above have influenced the reversal of the downward organic trend, new forces are emerging that will reduce the total depot maintenance workload requirement. Our analysis indicates that future reductions in

[8]Chapter 146 of Title 10, United States Code.

depot maintenance requirements will make it increasingly difficult to sustain the organic depot base at the current personnel floors. Most of the personnel we interviewed agreed. DESCOM is already having difficulty maintaining the level of staffing at the electronic depots as required by statute. The following technological and political changes will affect depot maintenance requirements.

Increased Reliability of New Systems

New systems being designed and fielded are more reliable than the equipment they are displacing, particularly in the electronics area. In some cases, the mean time between failures (MTBF) is proving to be far better than the specifications required. Additionally, older systems are being improved through modifications, and frequently, those modifications are undertaken expressly to extend the time between overhauls. Items that once were overhauled every 4 years may be overhauled every 8 years after modification.

New Modular Designs

Newer systems are being designed so that they can be maintained and repaired without having to send the entire end item to a depot. That design significantly reduces the times that an end item must go to a depot for a complete overhaul. The new systems are modular and utilize the remove-and-replace concept. While such design may result in an increase in the depot repair requirements for secondary items, that increase will probably not be enough to offset the reduction in end-item overhauls.

Force Reductions and Budget Cuts

The peacetime workload generated is a function of weapon system densities and operating tempo. As densities and equipment operating hours decrease, the generation of unserviceable assets also decrease and the time between overhauls increases.

As pressures on the defense budget grow and the "cold war" abates, the likely result will be a reduced force structure, which, in turn, will lead to a further reduction in the maintenance requirement.

SIZING THE DEPOT MAINTENANCE CAPACITY

Background

At the same time the organic workload was decreasing in the mid 1980s, the organic physical plant capacity was increasing. That combination of factors resulted in a decrease in the utilization of physical capacity. In 1985, utilization was about 63 percent of capacity. In 1989, the utilization was slightly more than 56 percent.

Operating the organic system at low rates of utilization is inherently an uneconomical and inefficient practice. It increases the unit cost to repair an item and decreases the overall productivity index.

Peacetime Capacity and Utilization

Figure 2-3 shows the level of excess capacity at each of the Army's organic depots. DoD has the following policies that address how physical and peacetime capability and capacity should be planned:[9]

- Organic depot maintenance capabilities and physical capacities established or retained within the DoD components for support of DoD material shall be kept to the minimum required to ensure a ready, controlled source of technical competence and the resources necessary to meet military contingencies.[10]
- DoD component facility utilization (by depot) in peacetime shall be planned to accomplish the equivalent of 100 percent of peacetime workload on a 40-hour week, one-shift basis with the equivalent of 185 percent physical capacity under mobilization.[11]
- Criteria for the establishment and retention of a depot maintenance capability should be based on supporting the workload demand created by the approved weapon or end-item equipment inventory with appropriate consideration for economic factors and wartime/emergency surge analysis.[12]

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[9]Physical capacity is defined as the workload, expressed in man-years, that can be accomplished at a facility during single-shift operations without considering administrative personnel constraints (vacation, sick time, training, etc.). Peacetime capacity takes this nonproductive time into account.

[10]DoDD 4151.1, *Use of Contractor and DoD Resources for Maintenance of Material*, 15 July 1982.

[11]Ibid.

[12]DoDI 4151.15, *Depot Maintenance Programming Policies*, 22 November 1976.

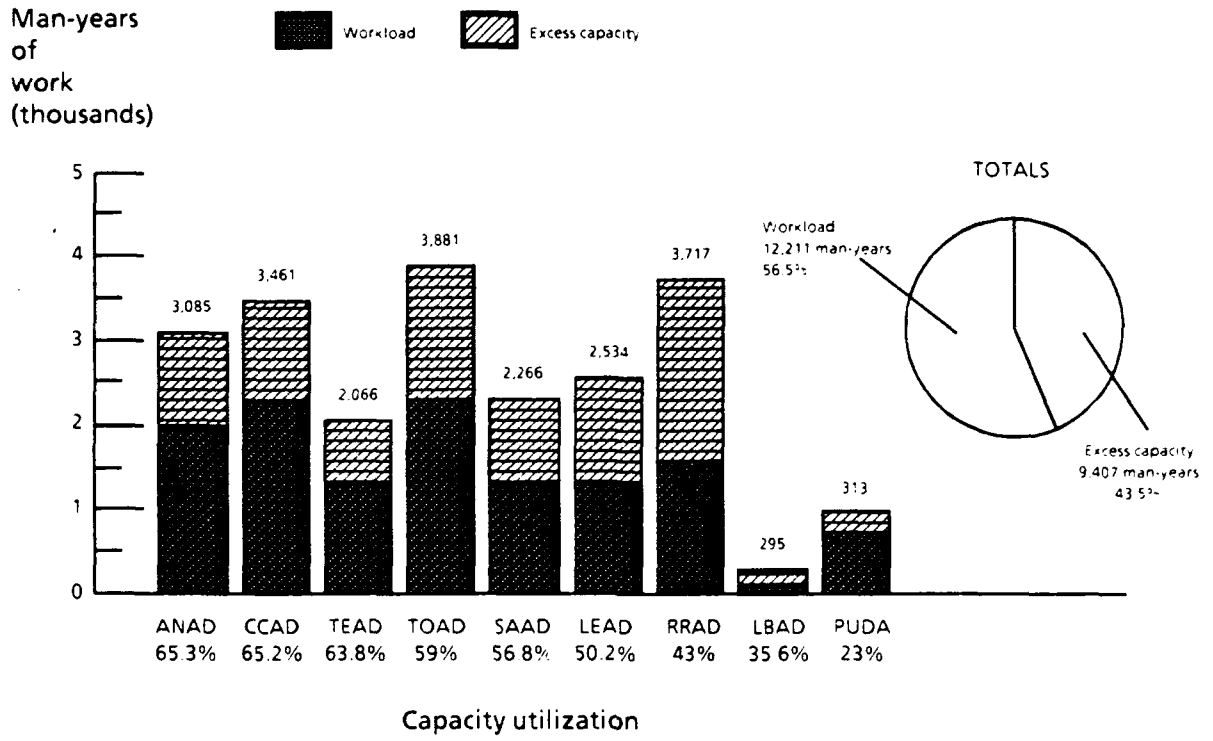

FIG. 2-3. ARMY DEPOT WORKLOADS AND CAPACITY

Mobilization requirements and depot surge capacities are not considered by DESCOM when assigning peacetime workloads. To consider them properly, the mobilization requirement estimates must be accurate.

As Figure 2-4 shows, even if all the contract workload was moved to organic facilities, the depots would still have excess capacity.[13] A large portion of the contract workload cannot be absorbed, nor should it be. It is equally in the interest of national security that DoD retain a competitive commercial industrial base capable of expanding during mobilization.[14]

[13]Contract workload was estimated from the organic workload and the 1989 funding ratio of 60/40 organic/contract. That ratio probably overstates the contract workload because it assumes the same rates as organic apply.

[14]DoD D 4151.1, op. cit.

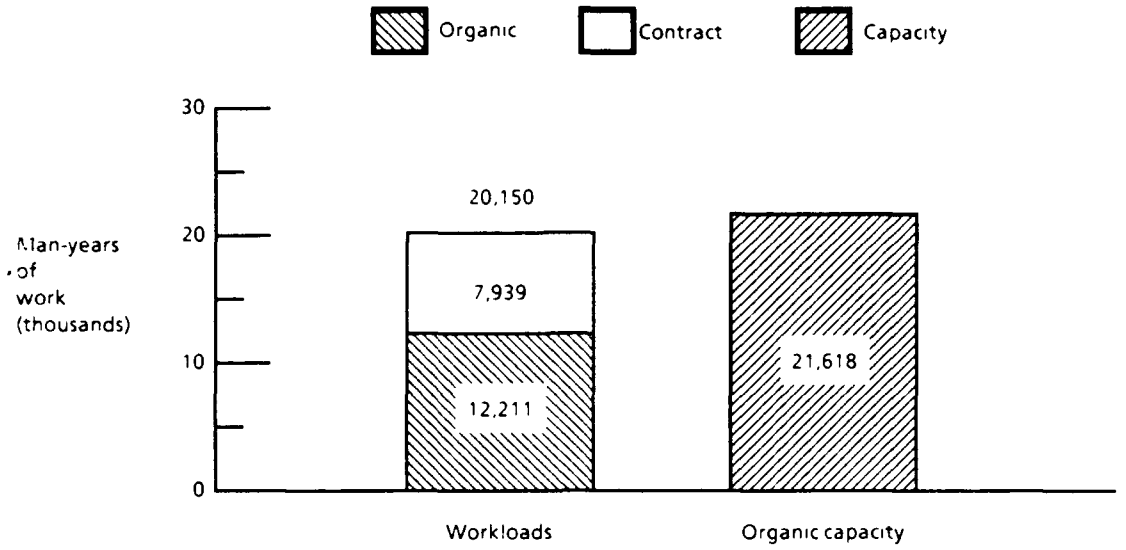

FIG. 2-4. ORGANIC CAPACITY VERSUS ORGANIC/CONTRACTOR WORKLOADS (FY89 through FY95)

Impact on Productivity and Prices

Overhead costs and direct maintenance hours and costs are used to measure efficiency and productivity at DoD depots. Excess capacity, low workload levels, and the resultant low rates of utilization have a negative effect on efficiency and the productivity index. The goal is to maximize the amount of direct work performed and minimize the overhead cost. Since depot maintenance is an industrially funded operation, the intention is to recoup these costs through customer charges. How much a customer pays for a unit hour of work is determined by the total number of direct hours expended, plus the share of overhead per direct hour. Figure 2-5 shows this relationship.

The costs of maintaining unutilized or underutilized buildings and equipment are included in overhead and are incorporated into the hourly rates. Such direct mission overhead as supervisory and staff support personnel and such base operating costs as security and fire fighting are spread across the direct hour base. Retaining more direct workers than the workload requires also adversely affects costs and productivity.

Underutilization of depot facilities or manpower means that the Army is getting less equipment repaired for its depot maintenance dollars.

$$\text{Productivity} = \frac{\text{*Direct labor produced (total hours)}}{\text{*Direct costs + **overhead (total costs)}}$$

$$\text{Hourly rate} = \frac{\text{*Direct labor costs + ** overhead}}{\text{*Total direct hours}}$$

*Increasing direct labor = Increased productivity and lower hourly rates (smaller degree of impact)

**Decreasing overhead = Increased productivity and lower hourly rates (decreases total costs)

FIG. 2-5. RELATIONSHIP BETWEEN CAPACITY AND PRODUCTIVITY/COSTS

Ways to Increase Utilization

As discussed above, increasing the utilization rates at the depots can increase efficiency and productivity. Utilization rates can be increased in several ways.

Balancing Workload and Capacity

As shown in Figure 2-5, the way to achieve higher utilization and reduce overall costs is to decrease overhead. By reducing the number of buildings occupied at a depot through the consolidation of similar workloads, utility and building maintenance costs can be saved. The elimination of an entire depot through a similar process would reduce overhead the most. Increasing the organic workload also can improve productivity and reduce unit prices, but on a smaller scale. In the near term, it may be possible to increase organic workload by bringing in house more of the dual-sourced aviation components. However, long-term projections show that overall workload requirements probably will decrease as the technology advances and the

force structure is reduced. A sustained increase in organic workload over today's requirements is unlikely.

Recalculate Physical Capacity

Finally, the Army can improve its utilization statistics by calculating physical capacity in a more realistic manner. Our review of capacity measurement methods at one Army depot leads us to conclude that total capacity is probably overstated. Work positions that are included in the calculation could not be productively filled given the shop design and expected product mix. While a change in the calculation method will not result in any true gains in productivity or efficiency, it will provide a more accurate picture of true capacity.

Mobilization Requirements

As previously discussed, an accurate forecast of the mobilization requirements is needed to plan organic capability and capacity properly and to balance the peacetime workload assignment. Those requirements also must be known to determine whether the commercial base can respond to surge requirements. Unfortunately, the depot maintenance mobilization planning system in the Army has several major deficiencies. To fix those deficiencies, mobilization planning needs to be accorded a much higher priority and profile than it is presently being given.

Present policy in the AMC Mobilization Planning and Execution System (MOPES) is to forecast maintenance mobilization requirements each year. From that forecast, DESCOM prepares an annual posture plan that discusses each depot's capability to expand to meet the requirement. In theory, the MSCs update the mobilization workloads by 1 July of each calendar year. DESCOM is supposed to report to AMC those requirements that are beyond the capacity of the organic system and they become candidates for contract repair. Major items in this category are then treated as candidates for industrial preparedness planning.[15]

In practice, this is not done. As Figure 2-6 shows, more than 80 percent of the mobilization man-hour requirements on file at DESCOM are from 1986 and prior years and over 55 percent are 5 years old or older. A uniform automated system has

[15]Under the procedures of AR 700-90, *Army Industrial Preparedness Program*, 13 March 1986.

not been available to forecast requirements since 1984, when MDMS was implemented.

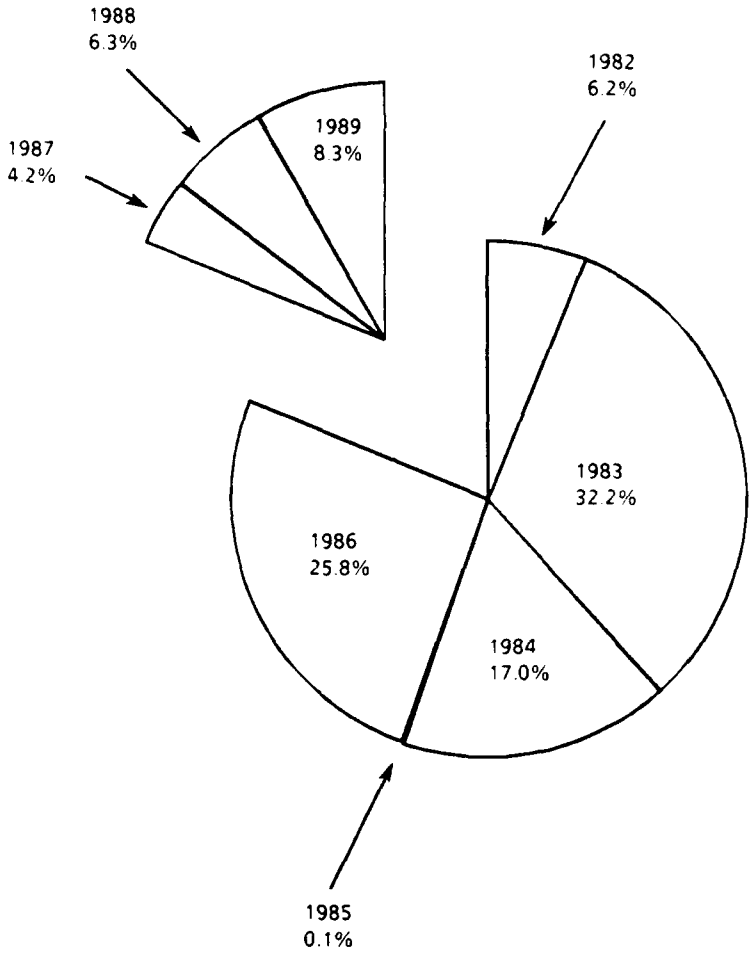

FIG. 2-6. MOBILIZATION MAN-HOURS ON FILE AT DESCOM DATE PROGRAM INPUT OR UPDATED

The MOPES provides specific procedures for calculating the requirements for major items. Only one MSC that we visited followed those procedures. For secondary items, the MOPES provides no guidance for calculating mobilization requirements.[16]

On their own initiative, some of the MSCs have adapted a byproduct of the war reserve automated process (WRAP) to calculate secondary-item depot maintenance

[16]The MOPES simply states that "mobilization requirements for secondary items are not now being computed."

mobilization requirements. On the other hand, one MSC uses 1.5 times the peacetime requirement. Table 2-2 summarizes the methods used.

TABLE 2-2

MAINTENANCE MOBILIZATION COMPUTATION
(Methods employed)

Commands	Major items	Secondary items
MSC 1	MOPES	WRAP
MSC 2	None	WRAP
MSC 3	1.5 x peacetime	1.5 x peacetime
MSC 4	None	None

The policies and procedures in the MOPES should be reviewed, clarified, updated, and implemented. For major items, the Army needs to reach a consensus as to the degree and timing of retrograding items back to CONUS. Such things as transportation resources and priorities, battlefield recovery practices, and cannibalization must be considered. These same factors will have an impact on the secondary-item repair requirements.

If the WRAP is going to be used, some key maintenance factors must be reviewed and program logic re-evaluated along with the major item factors discussed above. Table 2-3 highlights possible problems with the current factors.[17]

At least 11 different Army organizations have some involvement with planning mobilization requirements for depot maintenance. The Army should assemble knowledgeable people from those activities to recommend improvements that can be made to mobilization forecasting and the various assumptions that are used. DCSLOG and AMC should then make the necessary changes to the policies and automated programs.

Because of the age of the data (80 percent 1986 or older), the absence of adequate guidance and automated systems, and the absence or questionable validity of many computational factors, the current data does not provide the Army with a

[17]Appendix D, Table D-5, summarizes the organizations involved and their responsibilities.

TABLE 2-3

WRAP MOBILIZATION FACTORS

Factors	Purpose	Comment
End-item density	Monthly population used for calculating war consumption	Battle losses not considered
Maintenance task distribution (MTD)	Percent of repair in theater and at depot	Taken from provisioning, they are not updated from actuals
Task distribution modifier	Modifies MTD for wartime conditions	Peacetime used without modification
Washout rate	Percent of assets that are condemned	Validity of data questionable
Washout modifier	Modifies washouts for wartime conditions	Peacetime used without modification
Repair delay time	Delays initial retrograde of unserviceables to CONUS if resources are constrained	Peacetime used without modification
Failure factor II	Percent of failure of a component above peacetime due to combat operations	Method of determining and updating questionable
Inter/intra losses	Asset losses due to enemy action	Not considered for maintenance returns

sound basis for determining and defending its mobilization maintenance capacity requirements.

Summary

The goal of capacity planning is to balance the peacetime workload with the mobilization workload to fully utilize the depots in peacetime and still be able to produce the wartime requirements. Figure 2-7 illustrates that given the current peacetime workload and the stated mobilization requirements, the Army has excess organic capacity at each of their depots. Also, mobilization surge rates are unevenly distributed. However, since the accuracy of the mobilization requirements is highly questionable, any major realignment would be risky without first recomputing the mobilization requirements.

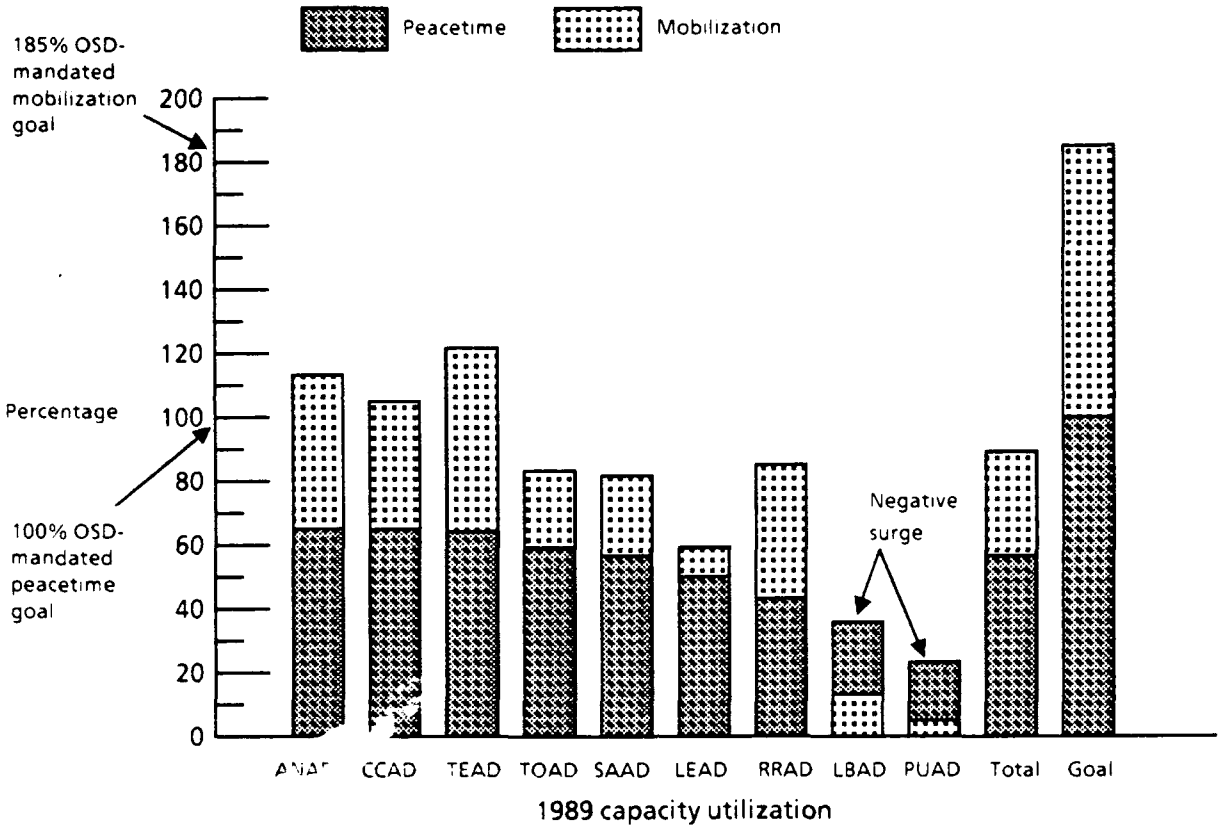

FIG. 2-7. ARMY DEPOT CAPACITY UTILIZATION
(Peacetime and mobilization)

THE DECISION PROCESS

Background

The decision on whether to repair a weapon system or component at an organic depot or to contract for the repair – the source-of-repair decision – is the most important action that affects the generation of organic workload and the planning of organic capacity. If the Army is to have confidence that the available industrial base (organic, inter-Service, and contract) for depot maintenance is properly utilized, it should have a formal decision, approval, and implementation process.

The depot maintenance source-of-repair decision process should consider a number of factors and needs to be closely coordinated across each functional area that has depot maintenance interests and responsibilities. The decision for the weapon system itself may be different than the decisions for some of its constituent assemblies. The approval procedure should not only consider the merits of the

specific system decision but must also evaluate the decisions against the present and future requirements of the combined depot maintenance industrial base. Once approved, an implementation plan and schedule should be followed. The current source-of-repair decision process does not follow that kind of an approach.

Individual Decisions

In 1982, OSD directed the Services to submit for approval a decision tree for assigning source-of-repair responsibilities.[18] In 1983, a decision tree developed by DESCOM was submitted to OSD and formally approved. We reviewed the decision process and found several deficiencies.

In practice, we found that the coordination between players varied significantly. Much of the variation may be attributable to the establishment of the Army Acquisition Executive (AAE) and PEO organization. Today, for the most part, the PMs report to a PEO. In general, the ILS responsibilities of AMC and the PEO have not been completely clarified under the new organization. The working relationships among the PEO/PM, the NMP, and DESCOM are evolving differently at the various commodity commands.

We examined the decision methodology used for 15 different weapon systems at four commodity commands. Table 2-4 is a listing of the types of systems we evaluated by commodity, procurement method used, and source of repair. A summary of our findings is contained in Appendix E. In general, we found recordkeeping to be incomplete, and we had to rely strongly on the recollections of personnel involved for the rationale behind most decisions. For some systems, even this proved to be difficult because of the high rate of personnel turnover.

We found no evidence that the decision tree had ever been used or that it had ever been officially disseminated. Most of the personnel interviewed did not know of the decision tree's existence. (A new decision tree was disseminated recently in AR 750-2.)

All of the decisions we evaluated appeared to be logical. However, we were unable to evaluate the AAE-level decisions because the supporting data were not

[18]Revision of DoDD 4151.1, *Use of Contractor and DoD Resources for Maintenance of Materiel*, 15 July 1982.

TABLE 2-4

MAINTENANCE SOURCE DECISIONS

Weapon	Type	Source	Slip
Blackhawk helicopter	D	ICS	Yes
Apache helicopter avionics	D	CLS[a]	N/A
Apache helicopter mechanicals	D	ICS	Yes
Apache target/pilot night vision	D	CLS[a]	N/A
CH-47 helicopter	P	ICS	Yes
Mobile subscriber equipment	N	CLS[a]	N/A
Single-channel ground/air radio	D	ICS	Yes
Patriot missile	D	ICS	Yes
Fiber-optic guided missile system	S	Organic	N/A
Pedestal-mounted Stinger missile	N	ICS	Future
Multiple-launch rocket system	D	ICS	Yes
Army tactical missile system	S	ICS	Future
Advanced antitank weapon system	S	Organic	N/A
Bradley fighting vehicle	D	ICS	Yes
M-1 Abrams tank	D	ICS	Yes

[a]AAE-mandated decisions

Notes: D = developmental, P = product improvement, S = streamlined, and N = nondevelopmental.

available. Those decisions were reportedly made on the basis of life-cycle costs alone and are probably not in accordance with decision tree logic.

Revised Decision Tree Logic

The revised source-of-repair decision tree places decision-making responsibilities with the PM. Based on our research, we believe that the decision tree will not be effective unless the decision logic, coordination requirements, and approval process are clarified and the decision tree is included in a suitable regulation that is normally used by the PM. A detailed discussion of the regulations is presented in Appendix A.

Our most significant findings with respect to the revised decision tree are summarized below and presented in more detail in Appendix F.

- The tree is designed to be used for an entire weapon system and does not consider that different sets of circumstances may exist for some of the weapon system's components.
- The logic does not adequately define how mission essentiality is determined nor how priorities are set.
- One block asks whether the system is "core"; since the definition of "core logistics" is vague, the PM cannot logically answer that question.
- The narrative accompanying the tree implies that cost comparisons may be required. However, the narrative does not adequately address when those cost comparisons are required and how they are to be done. As we stated earlier, cost comparisons are a volatile issue in the defense community.
- The tree does not allow for the establishment of dual capabilities, an important consideration when an item is highly critical and likely to be strongly affected by a high mobilization surge.
- Item density and reliability should be considered and included in the instructions. Low-density, low-failure-rate systems should be considered for contract repair.
- The narrative states that the decision process will be completed for all systems on an annual basis or in between when the need arises. That requirement is unrealistic and unnecessary.

Program Oversight

The size of the peacetime organic and contractor depot maintenance base is the derivative of all the individual system decisions and implementation plans. Each source – organic and contractor – must be capable of meeting both peacetime and wartime mobilization requirements. DoD policy requires that organic capacities be held to the minimum needed to meet military contingencies. At the same time, a competitive commercial depot maintenance base capable of expanding during mobilization must be maintained. The Army desires to provide the required maintenance in the most cost-effective manner possible consistent with preserving national security. The best way to influence the result is to have an organization that has visibility over the entire program, approving the individual decisions and making the necessary adjustments needed to realize overall goals.

Decentralized Management

In our review of the program oversight function, we found that no single organization is able to manage and oversee the total depot maintenance program. Management of the program is highly decentralized and procedures vary widely at different MSCs. At some MSCs, the NMP is responsible for programming, budgeting, and executing the maintenance program; at others, the NICP is responsible. Methods of developing priorities and program quantities also vary widely.

The Operation and Maintenance Army (OMA) Programs Branch, at AMC wields the most control over the program. The planning, programming, and budgeting process is strongly dependent on the size of the organic depot maintenance work force. AMC fully funds the organic labor pool on the basis of the number of personnel assigned to each depot. The remainder of the available funding is assigned to national maintenance contract programs at each MSC. When a budget decrement must be absorbed during the execution year, it is normally taken from contract funds that have not yet been obligated. Much of management's attention is taken up by monitoring the Army's compliance with the minimum 60 percent organic funding floor imposed by Congress.

Information Systems

It is difficult to manage a program as large and complex as the Army depot maintenance program without reliable data and a good management information system. While information is abundant for the organic portion of the program, little similar information on contracted depot maintenance is available. Very little information is maintained on a line-item basis for items that are being repaired under contract.

Originally, DESCOM was responsible for maintaining contract execution data on the master file maintenance (MFM). Those data are needed to monitor costs and measure production against schedules. When contract funding control shifted from DESCOM to each MSC, these types of data were no longer provided on a routine basis. Once a contract is awarded, little is known about the status of individual line items that are repaired under the contract.

For organic programs, individual NSNs are identified in the MDMS. Throughout the year, the depots input execution data against the program. For

contracts, many of the MSCs extensively use a pseudo-NSN – a bulk PRON – that represents all the specific items to be repaired. These bulk PRONs make it difficult to capture execution data. Even when valid NSNs are used on item-specific PRONs, execution data for contracts are not input.

In addition, no means is available to stratify the total program by mission essentiality. For the purposes of this study, we used the essentiality code contained in the Army Master Data File; however, it is not completely accurate for secondary items. The Army has not reassigned essentiality codes as required by DoD directive.[19] The new coding system relates the essentiality of the secondary item to the mission of the end item it supports. Similarly, the required essentiality listings[20] have not been prepared.

Risks of Contracting

Many in the Army feel that there is great risk in relying on contractors to perform depot maintenance. During this study, we found no reason to believe that the contracting out of mission-essential work to be performed at CONUS contractor facilities is inherently risky. During a national emergency, the President can invoke powers to control industry. Short of a declared emergency the risks increase, but how much they increase is uncertain. After all, private industry is relied upon to produce the same weapon systems it would be repairing.

However, there is evidence to suggest that contractors cannot be counted on to perform depot level maintenance in close proximity to combat zones. If the depot maintenance concept for an essential system requires the use of on-site depot technical assistance teams, then this may be a valid justification for establishing an organic capability. Although the Army may use such teams, there is no written Army policy establishing them or describing the circumstances under which they may be used.

The following risks were most often cited:

- Strikes
- Bankruptcies and takeovers

[19]DoDD 4140.59, *Determination of Requirements for Secondary Items After the Demand Development Period*, 13 June 1988.

[20]DoDI 4151.15, *Depot Maintenance Programming Policies*, 22 November 1976.

- Refusal to continue support in wartime for moral reasons
- Lack of flexibility
- Inability to expand quickly to meet a surge
- Competition with production resources during wartime
- Lack of interest when the item is no longer in production.

Strikes, Bankruptcies, and Takeovers

Strikes, bankruptcies, and takeovers are more of a peacetime concern than a wartime problem. During a national emergency, the Government has broad powers to control industry. The Federal Emergency Management Agency (FEMA) has the responsibility to consider the need for controls on the economy to channel industrial effort from commercial to emergency support activities. During undeclared emergencies, the risk increases.

Moral Objections

Most defense contractors are not likely to refuse to support a cause considered to be immoral. AMC cited cases during the Vietnam war in which contractors dropped off the list of registered wartime producers on moral grounds. However, we could not find any examples where actual contracts were involved.

Lack of Flexibility

The flexibility argument holds that the organic depots can quickly put together civilian teams to assist the field with maintenance. However, the Army has no written plans to augment field activities with teams from the depots. Nor does the Army assign many active duty military to the depots in order to maintain a degree of depot-level skill that could be used in times of mobilization. If the Army needs these teams to support the field for selected essential systems, this would constitute a strong justification for establishing an organic capability.

It is widely believed that the organic system is more flexible to changing priorities and short-notice requirements; however, one MSC strongly argued that they were not as flexible or responsive as most of their contractors.

Inability to Expand Rapidly/Competition with Production

The depots' ability to expand quickly to meet surge requirements is the most-often-cited reason for directing workload to the organic system. Although this concept is backed by the core logistics legislation, little evidence is available to suggest that industry's ability to expand is significantly less than that of the organic depots. In some cases, it may be true. It depends on the mix of production and maintenance requirements in the facility, the number of shifts operated in peacetime, the local hiring market, etc. In other cases, the contractor may be in a better position to surge than the organic depots.

The only way to know for certain which is most able to expand rapidly is to reasonably estimate the wartime requirements and match those needs against the particular circumstances. Unfortunately, as we discussed earlier, the Army does not have a system for accurately forecasting wartime requirements. Furthermore, it does not have a program to conduct Industrial Preparedness Planning (IPP) with maintenance contractors to establish surge requirement agreements.

If the wartime requirement happens to be less than the peacetime requirement – and such may be the case for many items – potential risks are drastically reduced. In any case, surge clauses can be used to lessen potential risks. For particularly sensitive systems, the use of a dedicated repair facility to avoid competition with production may be considered in the source selection process.

Lack of Interest in Maintenance

This final risk area is the most difficult to predict. When older technology and older systems go out of production, it is possible that the contractor may have little interest in providing maintenance and spare parts. The organic depot system may be the only way to maintain some older systems. Such an approach runs counter to that supported by many who would like to see the newer technologies in the depots and the older systems maintained under contract.

Transition Planning

Reliance on contractors for the initial support of new weapon systems is inevitable and will likely become greater in the future as the acquisition process becomes more streamlined. That approach has long been recognized within DoD as a logical and cost-effective way of doing business. OSD guidance in this area is very

clear: system maintenance should not transition to organic depots until after the design is stable and the organic capability to support the item has been demonstrated. Premature investment in organic support capability can be extremely expensive if early design changes nullify the support equipment, parts, and repair standards procured.

When it is decided to follow ICS with organic support, many things must fall into place for the system to make a successful transition. Figure 2-8 shows the requirements that must be met. Responsibility for these items crosses many organizational lines. Someone should direct and guide these pieces into place according to a published and agreed-upon schedule. The transition schedule and workload projections must be known to organic planners well in advance of the transition date. Slippages in transitions can have serious effects on organic facility workload stability.

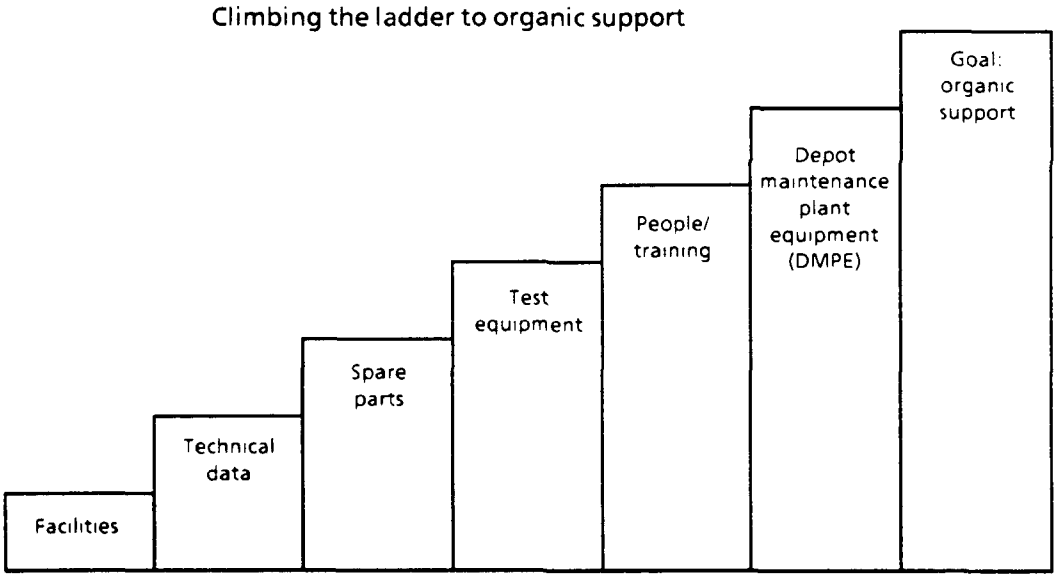

FIG. 2-8. TRANSITION PLANNING, THE STEPS THAT MUST BE CLIMBED

As Table 2-4 on page 2-21 shows, many systems slip past their scheduled transition dates. The early identification, funding, and procurement of the technical data package (TDP) is one of the most critical factors. A transition plan that spells out specific duties and responsibilities is an invaluable tool.

RECOMMENDATION

We recommend that DCSLOG take the following steps to improve organic depot maintenance capacity and utilization:

- Adjust billets and workload at organic depots to create a closer match with the peacetime requirements and the updated mobilization requirements. DCSLOG should attempt to resist congressional pressure to establish personnel floors at specific depots and organic/contractor funding quotas and should consider moving some nonessential organic workloads to contractor depots and moving some aviation-essential workloads from contractor depots to organic depots. Essentiality codes should be reassigned in accordance with DoD policy and incorporated into the system. DCSLOG should also consider establishing aviation repair capabilities at a second organic depot. This would allow moving some contractor workloads to organic depots without moving personnel. Physical capacity should be reduced where it is not needed by closing portions of buildings or entire buildings in order to reduce overhead costs, and utilization statistics should be improved by recomputing capacity based upon the DoD guidelines. A more comprehensive realignment of organic capacity is needed in the long term since overall requirements are likely to decrease. DESCOM's initiative to reevaluate the role of the Army depots, called READY 2000, should be given a high priority.

- Improve the depot maintenance mobilization forecasting and reporting program and use the results to assess the needed size of the organic base. The Army should reevaluate wartime in-theater repair concepts and transportation plans, update and promulgate mobilization policies and guidelines, and enforce the annual updating of the mobilization program.

We recommend that DCSLOG take the following steps to improve its depot maintenance source-of-repair decision and implementation process:

- Modify the decision tree logic to provide more clarity and flexibility. DCSLOG should remove the annual requirement to review all past decisions, eliminate the core logistics block as a decision element, and clarify the requirements to conduct cost comparisons. DCSLOG also should consider such factors as density and reliability, unique component characteristics, and dual sourcing for highly essential large-surge-rate items.

- Disseminate the decision tree through ILS regulations. The PEO or PM is responsible for the initial source-of-repair decision and has the earliest involvement. These decisions, made early in the life-cycle of a new system, are critical to whether a system will migrate to organic support in the future or stay commercial. The requirement to use and document decision tree

logic should be placed in AR 700-127, *Integrated Logistic Support*, the regulation that specifically addresses PM ILS responsibilities.

- Increase the management role of AMC. Source-of-repair decisions made by the PM should go through AMC for final approval. The Army must ensure planning and oversight of the total organic, inter-Service and contract program for both peacetime and mobilization. The individual decision may be logical for justifiable reasons; however, it may not support overall, long-term goals. AMC should have the macro view and coordinate responsibilities and roles among the commodity commands, DESCOM, and the other Services and assist the Army PEOs on logistics matters.

- Require more thorough transition planning. DCSLOG should ensure that the funding and procurement of the TDP and the required test and plant equipment are properly considered. DCSLOG should require a DMSP for each new system. AMC should closely monitor transition to prevent slippage.

- Decrease wartime contractor risks by using surge clauses.

CHAPTER 3

THE CONTRACTING PROCESS

INTRODUCTION

Commercial repair facilities are a substantial source of secondary-item depot maintenance for the Department of the Army. Their role as a source of depot maintenance is defined by a contract. The process that leads to the development of a contract involves the functional interaction of materiel management, maintenance management, and procurement.

In this chapter, we analyze the depot maintenance contracting process for secondary items with the objective of determining the need for and recommending improvements. We separately address three issues: The first issue is the types of contracts used in that process for depot maintenance; the second issue is the maintenance information requirements and the system to accommodate them; and the third issue addresses the routing of unserviceable materiel from retail activities to depot maintenance contractors. For each issue, we present major findings, conclusions, and recommendations. Appendix G provides additional details.

CONTRACTING METHODS FOR DEPOT MAINTENANCE

The Reliability of Unserviceable Return Forecasts

The reliability of the unserviceable return forecasts, i.e., the number of assets for each item that will be returned and will require repair, is a key determinant in selecting the best type of contract to be used for contract maintenance. To assess the reliability of the forecasts of returns, we analyzed 75 different forecasts from the 4 MSCs visited. The results of that sample are shown in Figure 3-1. Of the 75 forecasts we analyzed, 35 percent deviated by more than 100 percent from actuals. Only 29 percent were within plus or minus 25 percent of the actual returns.

The Need for Flexibility in Establishing Contract Quantities

Because depot maintenance requirements forecasting is very unreliable, any assessment of depot maintenance contracting methods must consider two critical

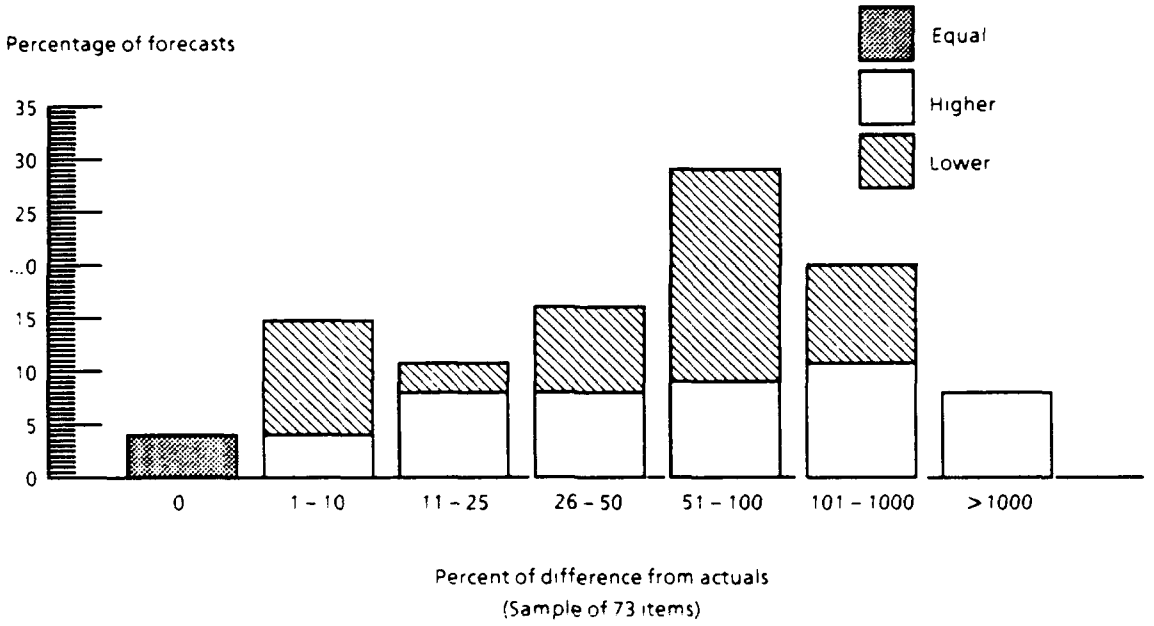

FIG. 3-1. ACCURACY OF UNSERVICEABLE RETURN FORECASTS

factors: the flexibility of the contract in establishing quantities of unserviceable materiel to be repaired during the contract period and the administrative effort and leadtime (i.e., the amount of time between identification of the requirement to repair assets and the induction of unserviceable assets into a commercial facility for repair). The MSCs are using several different techniques to compensate for the forecast error. They include accumulating unserviceable assets before awarding contracts, and using service contracts, basic ordering agreements (BOAs), and indefinite-delivery-type contracts.

Figure 3-2 displays the types of procurement documents used for contracting depot maintenance by the four NICPs visited. The figure shows the stark contrast in the contracting techniques used by the NICPs visited. Three of the NICPs rely primarily on definite-delivery-type contracts (76 percent) compared to the fourth NICP that uses primarily indefinite-delivery-type contracts (66 percent) and is increasing their use.

Service Contracts

At all NICPs, one contracting method used to alleviate the consequences of inaccurate returns forecasting is time-and-materials service contracts. Of 184 depot maintenance contracts identified in their current MILSCAP files at three NICPs,

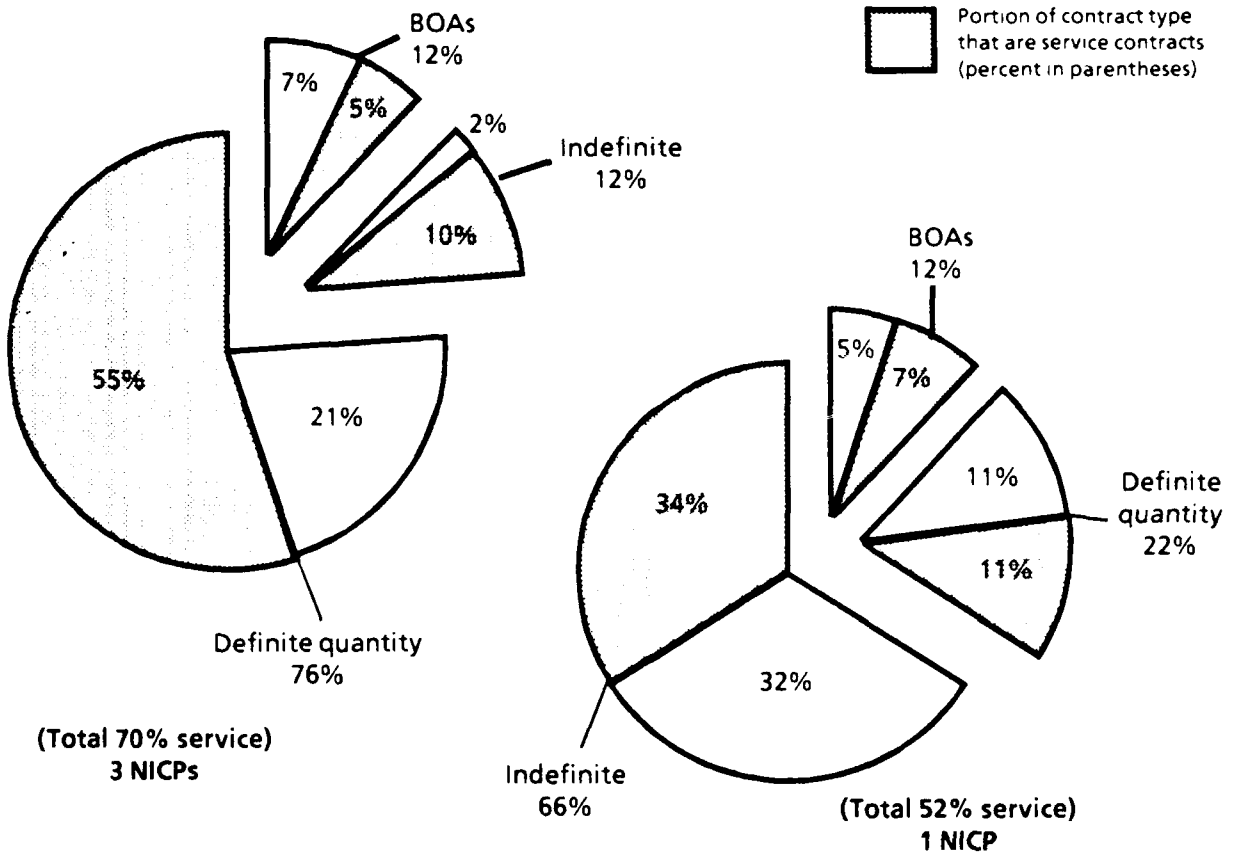

FIG. 3-2. TYPES OF MAINTENANCE CONTRACTS USED AT FOUR NICPs
(From 1 October 1987 through 31 March 1989)

129, or 70 percent, are service contracts. That type of contract generally identifies an end item for which repair services are to be rendered. While it may list the components of that end item covered by the contract, it does not specify them as contract line items. Consequently, contract abstract information and shipment or performance data recorded in the MILSCAP master file (MMF) for service contracts is not related to specific NSNs. That precludes monitoring contractor performance to ensure contract compliance. The other NICP still shows 52 percent of its contracts to be service contracts. However, that NICP is phasing out its service contracts as the current contracts expire. Service contracts are usually the result of "bulk" PRONs that cover multiple components of a single end item. In FY89, 49 percent of the national maintenance contract value was represented by bulk PRONs (100 percent at one NICP). Because PRONs are keyed to a single stock number in the maintenance system, bulk PRON information, while it applies to multiple components, is related

to an arbitrary stock number. Therefore, the specific data for each of the components covered by a bulk PRON usually are obscured in the maintenance system. When they are obscured, the parts explosion programs performed by the maintenance system will not consider them in computing repair parts for depot maintenance.

Definite Quantity Contracts

The same three NICPs also use nonservice definite quantity contracts extensively (21 percent of the total maintenance contracts). Contracts that specify definite quantities based on the unserviceable returns forecast do not provide the necessary flexibility to accommodate an inaccurate returns forecast. Based on the sample return data discussed earlier, definite quantity contracts would be too high or too low 72 out of 75 cases or 96 percent of the time. If the forecast is high and the definite quantity is based on the forecast, the Army will pay for repair work that cannot be performed. If the forecast is low, additional administrative effort and leadtime will be incurred to establish contract coverage for an additional quantity of unserviceable materiel.

To ensure that contract quantities do not exceed the amount of unserviceable assets that will actually be returned and need to be repaired, we observed that some NICPs accumulate the full or partial quantity of the unserviceable assets before awarding the contract. While assets are being accumulated, demands upon the supply system for serviceable replacements continue. Therefore, either inventory investment is increased to provide assets to meet demands during the accumulation period or backorders are established and readiness is adversely affected.

Basic Ordering Agreements

Another method used to ensure contract coverage when unserviceable returns exceed contract quantities, is establishing BOAs. A BOA by itself does not constitute a contract. That is accomplished by placing orders under the BOA. Each order thus represents a contracting action that, in conjunction with the BOA, establishes a separate set of contract provisions for a commercial facility to repair assets. While providing some flexibility, the use of BOAs increases procurement resources and administrative leadtime required to issue the orders (contracts) under the BOA.

Indefinite-Delivery-Type Contracts

One of four NICPs for which we collected data relies primarily on the use of indefinite-delivery-type contracts. At that NICP, 66 percent of the contracts we reviewed were indefinite delivery type. The Air Force also uses indefinite-delivery-type contracts extensively when contracting for depot maintenance because it, like the one Army NICP, has determined that such contracting techniques are most appropriate for depot maintenance contracting considering the difficulty in forecasting unserviceable returns.

The Federal Acquisition Regulation (FAR) describes two types of indefinite-delivery-type contracts in which a definite quantity need not be specified – indefinite quantity (with minimum quantity) and requirements-type contracts (no minimum quantity). Both of those contracting types provide the flexibility to establish contract quantities based on actual rather than projected repair requirements by placing orders as requirements and assets are generated. That procedure is advantageous to both the contractor and the Army. Even if actual repairs exceed forecasts, indefinite-quantity and requirements-type contracts enable the contractor to continue working without having the Army modify an existing contract or award a new one. They also eliminate the need to accumulate assets prior to contract award or the use of time-and-materiels contracts to compensate for the uncertainty of returns forecasts.

Multiyear Contracts and Options

Multiyear contracting not only conserves procurement resources but has the additional benefits of attracting more competition, promoting continuity of contractor performance, and encouraging productivity improvements through capital investment. The NICP that extensively used indefinite-quantity-type contracts also uses some multiyear provisions that permits exercise of the contract over a 3- year period. Where the FAR allows options to be employed in depot maintenance contracts, their use, like multiyear contracting, reduces the administrative time and cost of awarding and administering contracts. The use of options may also provide flexibility to increase contract quantities.

Repairs Delayed by Administrative Procedures

Delays after a contract is awarded result because of a particular procedure prescribed by Army regulations. AR 725-50 requires that a unique DoDAAC be assigned for each contract number/delivery order for which Government-furnished material (GFM), Government-furnished property (GFP), or Government-furnished equipment (GFE) is authorized or for which the contractor will requisition from the DoD supply system. The MSC must request assignment of a DoDAAC in writing and must show the effective date of the contract. MSCs generally defer submitting the request until the contract is awarded because of difficulty in determining the precise date of contract award. The process for requesting and receiving DoDAACs takes an average of approximately 1 month. That time adds to the delay before the contractor can requisition GFM or the Government can ship unserviceable assets because those events cannot take place until the DoDAAC is assigned. Permitting requests for assignment of DoDAACs based on estimated award dates could reduce that delay. The DoDAAC assignment policy also results in multiple DoDAACs being assigned to individual contractors. In fact, we counted as many as 60 different DoDAACs assigned to one contractor.

CONTRACT MAINTENANCE INFORMATION

The Army uses the Commodity Command Standard System (CCSS) to maintain accountability of unserviceable materiel under repair by contractors to determine the repair cycle times (RCTs), i.e., the time materiel is received by the repair facility to the time it is returned. The information requirements for contractor-repaired materiel are similar to those for organic-depot-repaired materiel; however, a different set of procedures is required to account for issues to, receipts from, and materiel in the hands of contractors.

Improving the Army System

Inefficiencies in Posting Receipts by Contractors

Receipts for materiel received by contractors are processed differently at different NICPs. At some NICPs, contractor receipt is based on Form 1348-1 shipping documents returned by contractors. Other NICPs use a monthly status report Form 926. The Form 926 report and the Form 1348-1 are mailed by the contractor to the procurement office, which then provides them to the Distribution

and Transportation Division for updating inventory records. At all the NICPs we visited, the method of accounting for contractor receipts is labor intensive, delays posting of data, and increases the chances of input errors.

Under CCSS procedures, a receipt document is input by the Distribution and Transportation Division when the notification of contractor receipt is provided. For returns directly to contractors, the receipt document is then rejected (i.e., CCSS does not process the transaction) so the NICP can identify the depot to which the repaired materiel should be returned. The current process results in unnecessary and manual intervention since CCSS would automatically determine the depot to which the repaired materiel should be sent as it does for organically repaired materiel and materiel that is sent to the contractor through an Army depot.

Mistaken Receipt Processing of Repaired Materiel

Contractors returning materiel to an Army depot use a Form DD250; they use the same form to ship newly procured materiel. We observed that depots occasionally mistake receipts of contractor-repaired materiel for new procurements, and consequently use the incorrect document identifier code when receiving it. When that occurs, research and manual intervention are required in order to match the receipt to its appropriate due-in. Until the adjustment is made, total assets are overstated because the receipt posts the on-hand materiel without deleting a corresponding due-in. If the contractor were to attach a Government-furnished label to the DD250, it could be clearly distinguished from a DD250 used in new procurement and the appropriate document identifier code could be indicated. That would alleviate the problem.

Improving the Contractor Reporting System

Present Systems

Hard-copy reports that the contractor mails to the NICP monthly are used to account for the consumption of repair parts and the receipt or shipment of unserviceable materiel by the contractor. (One NICP is developing a method for contractors to report consumption data by mailing magnetic tape or keypunch cards.) At some NICPs, the 926 and 906 Reports, prepared by the contractor according to an Army data item description, are used. At other NICPs, the contractor formats the reports.

In all cases, the current contractor reporting systems are inadequate for several reasons. Because reports are only provided on a monthly basis and preparation and handling add further delays, information is not current. To update CCSS, the information is manually processed, and that labor-intensive procedure is more prone to input errors than machine processing. Finally, information is used to update materiel management files only. It is not used as a source of maintenance and contract execution data to update maintenance management or procurement files. Consequently, although the maintenance system is designed to maintain overhaul consumption data, contractor overhaul consumption is not recorded, and valuable data for computing repair part requirements are lost. Likewise, the procurement system is designed to maintain NSN-related shipment and performance data, but since that information is not recorded, a valuable source of data for contract monitoring and enforcement is ignored.

Electronic Data Interchange

The Navy has developed the Contractor Asset Visibility System (CAVS) to provide for interactive communications on a daily basis with its contractors. The system was designed to overcome the same contract depot maintenance deficiencies that beset the Army. The Navy furnishes software, computers, and modems to its contractors who generate electronic transaction reports to provide the Navy with better visibility of materiel at commercial repair facilities and improve the accuracy of Navy inventory control points (ICP) files.

We believe a similar system (detailed information is provided in Appendix G) would benefit the Army NICPs in managing materiel repaired by contractors. Using a Government-furnished computer, modem, and software, the contractor could transmit on-line transactions involving the receipt and induction of unserviceable materiel, the return of repaired materiel, and the requisitioning and consumption of repair parts. With that automated reporting system, the contractor would also automatically receive requisition status and other electronic communication from the Government. In addition to communications capability, the system would perform the following actions:

- Edit all transactions before submission
- Maintain contractor inventory balance files

- Maintain open requisition and status files, consumption data files, daily transaction files, requisition history files, and transaction history files.

The computer and modem would replace the terminals some contractors currently use to submit requisitions for GFM and to receive supply status.

The primary benefit offered by an automated contractor reporting system is that materiel located at a contractor facility would be accounted for in a timely and accurate manner. Because all contractor-submitted transactions would be stored in a history file, the system would also provide a continuous audit trail for reconciliation and monitoring as well as the basis for automated updating of the materiel management, maintenance, and procurement files. Such an automated system would also eliminate the need for the hard-copy reports that the contractor now provides the Army and would replace manual posting of contractor receipts, thus reducing the delay and labor associated with the current system.

ROUTING OF UNSERVICEABLE MATERIEL

Shipments Through Depots to Contractors

Most unserviceable materiel to be repaired by a contractor is first shipped to an Army depot for storage. Prior to placing it in storage, the depot visually inspects the materiel to verify the accuracy of the shipping document. It is reshipped to the contractor when directed by the item manager with a material release order (MRO). Occasionally, unserviceable materiel is shipped from the retail level directly to a contractor. The Navy and Air Force ship materiel directly from the retail level to contractors more extensively than does the Army.

Under certain circumstances, it is expedient to first ship unserviceable materiel that will ultimately be repaired by a contractor to an Army depot. If more than one source of repair exists, the item manager can judiciously allocate the materiel to a source on the basis of factors such as capability, capacity, and contractual provisions. When a transition from one repair source to another occurs (e.g., from interim contractor support to organic repair), the depot serves as a control point to ensure that materiel is not in the pipeline to the old repair source when the change occurs. If the repair of unserviceable materiel would cause available serviceable assets to exceed requirements, the depot would serve as a storage point until repair is required.

In the absence of special circumstances, shipment through an Army depot unnecessarily delays the repair of materiel, thus increasing inventory investment. It also increases the logistics costs (e.g., transportation and manpower) of getting unserviceable items to the repair source.

Direct Return from Retail to Contractors

Figure 3-3 depicts the differences resulting from the routing of unserviceable depot-level reparables directly from the retail activity to the contractor rather than through the wholesale depot storage system. The key differences are discussed below.

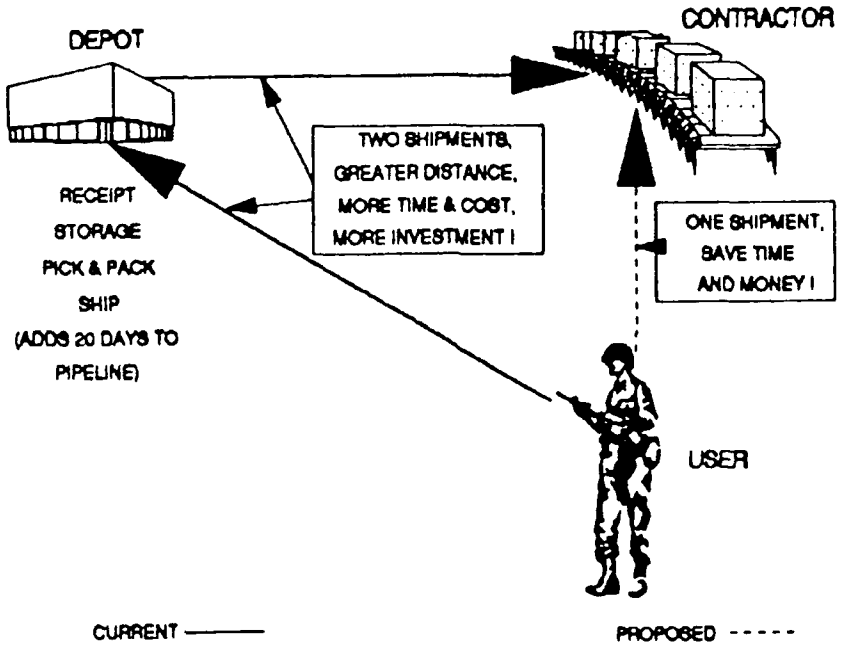

FIG. 3-3. SHIPMENT OF UNSERVICEABLE ASSETS

Reduced Intransit Time

Bypassing the depot would reduce intransit time, with the amount depending on the location of the customer and the depot relative to the contractor. We observed that materiel repaired by a contractor on the East Coast (designated as the only repair source for the materiel) was shipped by all retail activities (including those

closely located to the contractor) to a depot on the West Coast before being shipped back to the contractor on the East Coast. In that case, the additional intransit time and transportation costs become significant. In other cases, materiel is shipped to the depot closest to the contractor. We were unable to determine exactly the additional intransit time incurred by shipping through Army depots.

Reduced Depot Processing Time

Additional time savings could be realized by eliminating depot processing time if depots were bypassed. Army Regulation 725-50 establishes time standards for receipt processing. It gives the depot 10 days to receive unserviceable returns and post them to the accountable record. AR 725-50 also establishes 85 percent as the goal of on-time processing. Once the materiel has been processed by the depot, additional delays can be expected before the depot receives the MRO, pulls and packs the materiel, provides it to a carrier, and reestablishes movement to a contractor. Assuming that on average the depot processes materiel returns in 10 days, that MRO processing takes 8 days and that additional intransit time takes 2 days, 20 days would be saved if materiel were returned directly to contractors. The average daily value of national contract maintenance materiel is $1.4 million. Estimating that 70 percent of contractor-repaired materiel could be shipped directly, 20 days translates to about $19.6 million of inventory investment required to compensate for the added time it takes to ship the materiel through the depot.

Reduced Transportation Costs

Transportation costs are reduced by shipping materiel directly to contractors. The Government pays for a single shipment with less total mileage rather than two shipments with greater mileage and also incurs half the carrier administrative costs.

Reduced Depot Processing Costs

Direct shipment of materiel also eliminates depot processing costs to receive, stow, pick, and pack the materiel. DESCOM approximates its average cost in FY89 to receive and stow one shipment line item at $40.72. The retrograde intransit visibility report (RIVR) identifies approximately 68,000 shipment lines of unserviceable recoverability Codes D and L (depot-level reparable) items from the retail level to the wholesale level. Assume that about 29 percent (based on percentage of depot maintenance performed under national contract during FY89) or

slightly under 20,000 of those shipments consisted of items that are repaired by contractors. Assume further that 70 percent, or about 13,800, of those shipments consisted of items that could be directly shipped to the contractor. In that case, direct shipment would result in a saving of about $562,000 in depot costs to receive and stow materiel.

The DESCOM approximates the FY89 cost to pick and pack an average shipment line item at $24.28. Assuming that for every four shipments into the depot one shipment to a contractor resulted, 3,450 (13,800/4) shipments to contractors were processed by the depots. That translates to a savings of almost $83,000 in depot costs to pick and pack materiel for shipment to contractors. Thus, the total depot processing costs that could be saved equals about $645,000.

If materiel were shipped directly to contractors, no consolidation of shipments would be possible at the retail level. For materiel that would qualify for direct shipment, however, consolidation is probably minimal since a repair requirement would exist and delaying shipment for purposes of consolidation would not be permitted.

With direct shipment, the depot would no longer screen out materiel that has been misidentified or cannot be repaired economically. Discrepancies for all items received and inspected by depots during FY89 averaged between 6 and 7 percent. Because the depot only visually inspects the materiel, hidden defects are not normally detected. Considering the low discrepancy rate and the fact that the contractor is capable of providing a thorough inspection of the materiel (as contrasted to the visual one performed by the depot) and storing, returning, or disposing of those that are misidentified or not economically reparable, the lack of depot screening should not be a significant issue.

The process for accounting for materiel returned directly to a contractor instead of through an Army depot currently obscures the materiel until it is received by the contractor. That problem could be eliminated by redesigning the process. Specifically, the FTA document that notifies the wholesale level that an unserviceable item is being returned could post a due-in to the contractor. The FTM document that is submitted by the retail activity to the supply source when the materiel has been released to the carrier could generate an image to the Logistics Control Activity (LCA) for processing return rate statistics. The due-in would

provide the same visibility of the materiel while it is intransit to the contractor that it does for materiel that is shipped through a depot to a contractor.

RECOMMENDATIONS

Contracting Methods for Maintenance

To improve flexibility in establishing contract quantities and the administration of contracts, we make the following recommendations:

- MSC procurement offices should use definite-quantity contracts for depot maintenance only when they can determine repair quantities exactly (i.e., programmed maintenance).
- MSC procurement offices should use indefinite-delivery, indefinite-quantity, or requirements-type contracts for depot maintenance when flexibility in setting repair quantities is necessary.
- MSC procurement offices should use service-type contracts for depot maintenance only when the use of definite-quantity; indefinite-delivery, indefinite-quantity; or requirements-type contracts are not appropriate.
- MSC procurement offices should use multiyear contracting especially in conjunction with indefinite-delivery-type contracts whenever appropriate.
- When multiyear contracts are not appropriate, MSC procurement offices should use options to extend the term of depot maintenance contracts when the FAR Subpart 17.2 permits their use.
- AMC should revise AR 725-50 to allow requests for DoDAACs to identify the estimated effective date of the contract after solicitations have been evaluated and a contractor has been selected.

Contract Maintenance Information System

To improve the information management of depot maintenance contracts, we recommend the following:

- The NICPs should provide contractors with labels that say "a D6M transaction should be inducted for receipt of this materiel" and require contractors to attach a label on DD250s for repaired materiel that is being returned to a depot.
- AMC should develop an automated contractor reporting system that enables contractors to edit transactions, transmit information on-line, and maintain inventory balance files, open requisition and status files, consumption data

files, and transaction history files for automated updating of materiel management, maintenance, and procurement systems.

Routing of Unserviceable Materiel

To reduce the time and cost of shipping unserviceable materiel to contractors, and to provide visibility of materiel shipped directly to contractors, we recommend the following:

- AMC should require that retail activities ship unserviceable materiel directly to contractors unless more than one repair source exists, there is no repair requirement, or a transition from one repair source to another is taking place.
- AMC should revise CCSS to allow the FTM document to generate an image to LCA, the FTA to create a due-in to the contractor, and CCSS to determine the depot to which the repaired item should be returned when unserviceable materiel is shipped from the retail level directly to the contractor.

APPENDIX A

RECOMMENDED CHANGES TO ARMY REGULATIONS

ARMY REGULATION (AR) 750-2, ARMY MATERIEL MAINTENANCE, WHOLESALE OPERATIONS

Background

Army Regulation (AR) 750-2, recently published, contains depot maintenance policies and implements certain requirements contained in DoD Directive (DoDD) 4151.1 and DoD Instruction (DoDI) 4151.15.[1] Based upon our review of the AR, we recommend the following changes.

Recommendations

Data Information and Reporting Systems – Section 2-2 N

Recommendation	Comment
Add the requirement for the depot maintenance system to contain an end-item designation list that quantitatively identifies all mission-essential and non-mission-essential items.	Required by DoDI 4151.15. It is useful for managers to be able to stratify workloads by essential and non-essential.
Add the requirement for the depot maintenance system to track execution data for each item in a repair program, including those items repaired by contractors.	Execution data, including contract, must be reported annually to OSD as required by AR 37-55.[2] The Army should use these data to compare the planned program to the actual. By looking for trends, adjustments can be made in planning, programming, and budgeting.

[1]DoDD 4151.1, *Use of Contractor and DoD Resources for Maintenance of Materiel*, 15 July 1982, and DoDI 4151.15, *Depot Maintenance Programming Policies*, 22 November 1976.

[2]AR 37-55, *Uniform Depot Maintenance Cost Accounting and Production Reporting System*, 1 January 1981.

Depot Maintenance Support Plan (DMSP) – Section 3-9

Recommendation	Comment
Add a paragraph that states that the results of the source-of-repair decision and approval process, using the decision tree, should be documented in the DMSP.	Where and how the decision is to be documented should be included. We believe the DMSP is the best place.

Depot Maintenance Planning – Section 5-2

Recommendation	Comment
Delete the requirement that limits the planning of organic capability to not more than 70 percent of the mission-essential workload.	DoD approval of the Army source-of-repair decision tree removed this requirement. The 70 percent requirement was arbitrary. This was confirmed by OSD during our interview.
Require facility utilization to be planned to accomplish the equivalent of 100 percent of the peacetime workload capacity of the depot (versus the "minimum rate of 85 percent" currently required.	This will follow the requirements of DoDD 4151.1 exactly and will clear up a great deal of confusion.
State that the final determination of the source of repair is the responsibility of the Army Materiel Command (AMC) [versus the program manager (PM)].	This is consistent with AR 750-2, Appendix B, which states that AMC reviews and approves source-of-repair decisions. This is necessary if the total program is to be kept in balance with Army goals and requirements.

Mobilization Planning – Section 5-16

Recommendation	Comment
Specify the methods and procedures used to forecast mobilization requirements for both end items and secondary items, or reference the source.	The only specific guidance that we found was contained in the AMC Mobilization Planning and Execution System (MOPES). It stated that no computation is being made for secondary items.
Delete the discussion about, and the reference to, "closed-loop" support.	AR 710-1, the regulation referenced, has no discussion about "closed-loop" support.[3] This program ended after the Vietnam War.

Decision Tree – Section 5-21

Recommendation	Comment
The decision tree is discussed in detail in Appendix F. The use of the tree is principally intended for PMs and the maintenance decision is but one factor in the entire integrated logistics support (ILS) process. We recommend moving the tree and the requirements for its use to AR 700-127, *Integrated Logistics Support.* The decision should be included as part of the DMSP and its instructions, contained in Department of the Army (DA) Pamphlet 700-55, *Instructions for Preparing the ILSP.* Those documents address ILS planning requirements, and the PMs are familiar with them.	See Appendix F.

[3]AR 710-1, *Centralized Inventory Management of the Army Inventory System,* 1 February 1988.

AR 70-17 (DRAFT): PROGRAM, PROJECT AND PRODUCT MANAGEMENT

Background

Army Regulation 70-17 is a draft of a new Army regulation that will specify the responsibilities of the Program Executive Officer (PEO) PM. Appendix C (to the AR) describes system transition plan contents and format. This is the criterion that must be satisfied before the commodity command can assume management of the system. Appendix D (of the AR) contains a checklist.

Logistics Support – Appendix D (of the AR) Item 5k

Recommendation	Comment
Expand the discussion to require a DMSP that contains the source-of-repair decision documentation. If interim support is necessary, then a detailed transition plan for achieving organic support must be included.	PMs must be required to use the decision tree, obtain AMC concurrence, and document the result. For systems that must undergo transition from contractor to organic depots, a coordinated transition plan must be required.

AR 700-9, POLICIES OF THE ARMY LOGISTICS SYSTEM

Background

Army Regulation 700-9 contains the basic policies of the Army logistics system. Chapter 3 (of that AR) addresses maintenance policies.

Minimum Depot Maintenance Requirements – Section 3-5

Recommendation	Comment
Delete the requirement that limits the planning of organic capability to not more than 70 percent of the mission-essential workload.	DoD approval of the Army source-of-repair decision tree removed this requirement.
Require facility utilization to be planned to accomplish the equivalent of 100 percent of the peacetime workload capacity of the depot (versus the "minimum rate of 85 percent" currently required.	This requirement will align AR 700- 9 with the requirements of DoDD 4151.1 exactly and will clear up a great deal of confusion.

AR 700-127, INTEGRATED LOGISTICS SUPPORT

Background

Army Regulation 700-127 assigns responsibilities for the management of ILS. Maintenance planning is one of the ILS elements. It is the materiel developer's (MATDEV's) responsibility to ensure compliance with ILS policies and procedures. The principal MATDEVs are the PEOs/PMs.

Integrated Logistic Support Elements – Appendix B, Section B-2 (of this AR)

Recommendation	Comment
Add the requirement to use the decision tree, obtain AMC approval, and document the results. Decisions must be coordinated with the national maintenance point (NMP) and Depot Systems Command (DESCOM) and approved by Headquarters AMC. The decision should be documented in the DMSP.	The PEO/PM is responsible for the initial source-of-repair decision and has the earliest involvement. Decisions made early in the life cycle of a new system have the most impact on the direction the program will take. PMs must be required to use the decision tree and obtain AMC approval. AR 700-127 is a more appropriate regulation to implement use of the decision tree.

DA PAMPHLET 700-55, INSTRUCTIONS FOR PREPARING THE ILSP

Background

Department of the Army Pamphlet 700-55 contains the procedures for preparing the ILS Plan (ILSP). Appendix D (of DA PAM 700-55) contains the instructions and format for the DMSP.

Depot Maintenance Support Plan – Appendix D (of DA PAM 700-55)

Recommendation	Comment
Include the requirement to document the use of the source-of-repair decision tree in the DMSP.	The DMSP is the most logical place to record the decision and the reasons. DA PAM 700-26 requires that the plan be coordinated with DESCOM.[4] Preparation of this plan is a reportable milestone in the Acquisition Management Milestone System (AMMS).

AR 700-90, ARMY INDUSTRIAL PREPAREDNESS PROGRAM

Background

Army Regulation 700-90 establishes the basic policies, responsibilities, and procedures governing the Army Industrial Preparedness Program. The foundation of industrial preparedness planning is the realistic determination of mobilization production and maintenance requirements. Currently, planning is limited to those items that appear on the Industrial Preparedness Planning List (IPPL).

The planning being performed in the Army today is limited to production planning. Planning with industry for maintenance mobilization requirements is not performed.

[4]DA Pamphlet 700-26, *Acquisition Management Milestone System*, 22 May 1987.

Mobilization Maintenance Requirements – Section A-3 c

Recommendation	Comment
Change the period for determining the requirements from every 2 years to every year to be consistent with AR 750-2, AMCR 750-25, and the AMC MOPES.	The current requirement is annual to support the preparation of the depot maintenance posture plan.
Consider expanding planning to include maintenance for highly critical items.	Planning is now restricted to production.

AR 708-1, CATALOGING AND SUPPLY MANAGEMENT DATA

Background

Army Regulation 708-1 provides policy and procedural guidance on the cataloging of supplies and equipment. Included are the definitions and assignment criteria for the essentiality code and air-eligible category code.

Recommendations

Air Eligible Category Code – Table 7-3

Recommendation	Comment
Make this code required for all Class VII items (major items). Currently it is required for Class IX items (repair parts) and Class II items (consumables).	The AMC MOPES guidance for computing end item mobilization requirements restricts the computation to air-eligible items. The code that determines air eligibility is not a required field for end items. For most end items, this field is blank.

Essentiality Code – Table 7-9

Recommendation	Comment
Reassign essentiality codes in accordance with DoDD 4140.59.[5]	The Army currently codes most secondary items as essential because the coding system does not take the essentiality of the end item into account. Reassigning the codes will eliminate this problem and allow maintenance personnel to stratify requirements based upon mission essentiality.

AMCR 750-28, DEPOT MAINTENANCE PROGRAM SCHEDULING, WORKLOADING, AND REPORTING SYSTEM

Background

Army Materiel Command Regulation 750-28 provides specific policies, responsibilities, and procedures for workloading the Army organic depots. The regulation in the process of being revised. Many of the policies and procedures addressed in this regulation have never been implemented.

[5]DoDD 4140.59, *Determination of Requirements for Secondary Items After the Demand Development Period*, 13 June 1988.

The following policies have been in effect for some time, and should be implemented:

Policy	Comment
Program data for organic, national contract, inter-Service depot, and/or other Army and other Government activities will be passed to DESCOM. Upon receipt, the data will be placed in the depot maintenance data bank (DMDB). Program status will be reported monthly to DESCOM by the major subordinate command (MSC).	No contract or inter-Service execution data are being passed to DESCOM on a routine basis.
Requirements issued specifically for mobilization purposes will be identified and submitted on a yearly basis (on the first day of July of each calender year).	Most mobilization programs on file have not been updated since 1986.
Depot maintenance mobilization secondary-item requirements will be forecast in accordance with Commodity Command Standard System Operating Instruction (CCSSOI) 18-710-103, Volume II, Mobilization Schedule War Reserve Automated Process (WRAP).	Only two MSCs are attempting to use the WRAP.
DESCOM identifies mobilization workloads in excess of organic depot capacity to AMC. It also redistributes depot maintenance mobilization workload that is beyond a depot's capability to other organic activities by message.	This process is not being done.
DESCOM will calculate the percentage of mission essentiality for the Army-approved inventory and provide data to the MSC on magnetic tape. The MSCs will calculate and provide a mission-essential materiel status for each maintenance procurement request order number (PRON).	This field has never been properly filled in. It is either 0 or 100 percent.

Special Instructions

Recommendation	Comment
Delete references to "closed-loop" support procedures of AR 710-1.	Closed-loop support is not mentioned in AR 710-1. We believe this program was eliminated after the Vietnam war.

APPENDIX B

FUNDING – HISTORY AND FORECAST

SUMMARY

From 1984 through 1988, the percentage of the direct Army depot maintenance budget that was assigned to the organic base declined from 68 percent to 59 percent. Conversely, the contract program expanded from 32 percent to 41 percent in that same period. The growth experienced on the contract side was above inflation, while the organic base experienced a real decline in funding.

Those percentages represent the level of funding for direct Army depot maintenance programs only. Reimbursable work (Army stock funded item repair, work performed by the Army for other Services, and foreign military sales) is not included in the ratios.[1]

The decrease in funding for organic depots in relation to the contracting program was halted in FY88 and is expected to reverse beginning in FY89. The latest budget forecasts show that by 1991, direct Army organic expenditures will have grown to 65 percent of the total. The political, technical, and environmental factors that have caused the historical decline and subsequent projected rebound are detailed in Chapter 2 of the main text. The purpose of this appendix is to present the direct Army maintenance budget data along with a quantitative analysis of the magnitude of change.

HISTORY

Table B-1 shows the history and forecast for the direct Army depot maintenance program [Program Element (PE) 732207]. The history (1984 through 1989) was provided by the Army Materiel Command (AMC) and the Deputy Chief of Staff for Logistics (DCSLOG) in September 1989. The forecast is derived from the AMC OP-25 report dated July 1989 as modified by DCSLOG for submission to OSD. The funded

[1]The congressional floor that requires 60 percent of the Army's repair to be performed in organic depots includes reimbursable work performed at the Army depots. When included in the totals for reporting purposes, the Army has never fallen below the floor.

requirement contained in the OP-25 for 1991 was modified to take budget decrements and inflation into account.

TABLE B-1

DIRECT ARMY DEPOT MAINTENANCE PROGRAM
HISTORY AND FORECAST SUMMARY DATA

(Expenditures in millions of then-year dollars)

	History						Forecast	
Organization	FY84	FY85	FY86	FY87	FY88	FY89	FY90	FY91
Army depots	792	980	760	755	750	1,011	1,090	1,167
National Contract[a]	278	375	367	421	407	542	549	[b]
Mainz GOCO[c]	134	144	119	148	160	165	135	[b]
Lexington GOCO[c]	0	1	8	12	11	12	6	[b]
Korean Contract	0	0	4	3	5	9	8	[b]
Other[d]	73	85	86	88	82	71	78	90
Totals	1,277	1,585	1,344	1,427	1,415	1,810	1,866	1,929
Total organic[e]	865	1,065	846	843	832	1,082	1,169	1,257
Total contract[f]	412	520	498	584	583	728	697	627[b]
Organic percent	68	67	63	59	59	60	63	65
Contract percent	32	32	37	41	41	40	39	35

[a] National maintenance contracts awarded by the major subordinate commands (MSCs) (including interservice workloads).

[b] Unknown; total includes decrement of $132 million that must be applied to specific contract programs.

[c] GOCO: Government owned, contractor operated.

[d] Includes the arsenals, calibration center, and basic issue items (BII). Considered organic.

[e] The sum of the Army Industrial Fund (AIF) depots and "other."

[f] National maintenance contracts plus GOCOs and Korea.

Table B-2 shows the cumulative percentage of increase in contracted depot maintenance and the concurrent decline in organic depot maintenance that occurred between 1984 and 1988. Organic funding declined by 4 percent. Adjusted for inflation of 4 percent a year, the decline in funded workload becomes 18 percent. In the same period, contract funding grew by 41 percent, which when adjusted for inflation equates to a real growth of 21 percent.

TABLE B-2

1984 THROUGH 1988 DIRECT ARMY MAINTENANCE
GROWTH AND DECLINE

($ Millions)

	1984 ($)	1984[a] (adjusted) ($)	1988 ($)	Growth (%)	Growth (adjusted) (%)
Total organic	865	1,012	832	- 3.8	17.8
Total contract	412	482	583	41.5	20.9
National contract	278	325	407	46.4	25.2
GOCO/Korean contract/Mainz/ Lexington	134	157	176	31.3	12.1

[a] In 1988 dollars using 4 percent inflation per year.

A significant portion of the contract funding (about 30 percent) is used for Army GOCO facilities [Mainz Army Depot in Germany and Lexington Bluegrass Army Depot (LBAD) in Kentucky] and contracts in Korea. The LBAD was established in 1985, and contracts were first awarded in Korea in 1986. GOCO and Korean funding increased by 31 percent during this period, which when adjusted for inflation, represents a real growth of 12 percent. National maintenance contracts increased by 46 percent (25 percent real growth), or double that of the GOCO/Korean portion.

FORECAST

As shown in Table B-1, the trend has reversed starting in 1989. If these forecasts remain accurate, organic funding will grow to 65 percent of the total by 1991.

Table B-3 shows that organic funding is likely to grow by 51 percent between 1988 and 1991, or 34.3 percent above inflation. The net contract growth is 2 percent above inflation; however, budget decrements in 1991 will reduce 1990 contracting levels by 17 percent. Specific program and quantity contract decrements are being worked out by AMC.

TABLE B-3

1984 THROUGH 1988 DIRECT ARMY MAINTENANCE GROWTH AND DECLINE

($ millions)

	1988 ($)	1988[a] (adjusted) ($)	1991 ($)	Growth ($)	Growth (adjusted) (%)
Total organic	832	936	1,257	51.1	34.3
Total contract	583	656	672	15.3	2.4

[a] In 1991 dollars using 4 percent inflation per year

APPENDIX C

1989 PROGRAM ANALYSIS FROM THE MAINTENANCE DATA MANAGEMENT SYSTEM

INTRODUCTION

In order to determine and analyze the organic, inter-Service and contract workload more accurately, we requested several data tapes from the major subordinate commands (MSCs) we visited. We needed the tapes because the current Army systems and reports do not stratify workloads by mission essentiality and because inter-Service programs are included in the contract column on Army budget reports. With the assistance of the Computer Systems Development Activity (CSDA) in St. Louis, we received Maintenance Data Management System (MDMS) data tapes for the FY89 program. From them, we determined, by national stock number (NSN), which items were contract, which were inter-Service, and which were organic and the program dollar values for each. We were also able to evaluate the extent of use of bulk procurement request order numbers (PRONs) for contract programs.

The MSCs provided an extract from the NSN master data record (NSNMDR) for depot-level reparables. From that extract, we were able to determine the mission essentiality, type of item (principal or secondary) and type of weapon system (from the material category code). We used that information to evaluate the weapon systems and the essentiality of programs for which repairs were done by contractors. We also wanted to identify any nonessential items repaired at organic depots and identify items that were maintained by both organic depots and contractor depots.

After processing the initial data from an MSC, we discovered that many items in the FY89 program failed to appear on the depot-level files from the NSNMDR.[1] Manual research revealed that many of these NSNs were either missing a recoverability code or were below depot reparable. Because of this, we requested a tape from the Catalog Data Activity (CDA) for all items with blank or below depot recoverability codes.

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[1]Our search parameter was for all items with a recoverability code of "D" or "L."

From our analysis of the data we reached the following conclusions:

- The Aviation Systems Command (AVSCOM) has the largest portion (45 percent) of the contract program. Fifty-nine percent of the AVSCOM contract program is for the repair of secondary items. A significant portion is for items that are repaired by both organic depots and contractor facilities.
- Contractor life-cycle support (CLS) for fixed-wing aircraft represents approximately 33 percent of AVSCOM's contract program.
- Many AVSCOM items that are repaired only at contractor facilities are scheduled for transition to Army support.
- A substantial portion of the AVSCOM principal-item-overhaul workload at organic depots is coded as nonessential. This may be due to essentiality coding errors.
- Nearly all of the secondary items were coded as essential without regard to the essentiality of their end item. Thus, we were unable to stratify secondary items accurately by mission essentiality.
- The Army heavily uses bulk PRONs to manage contract maintenance programs. We were unable to acquire any line-item level information (essentiality, recoverability, and weapon system) for these PRONs.
- Approximately 12 percent of the program was used at Government-owned, contractor-operated (GOCO) facilities. Although the Army reports work done at such facilities as contract expenditures, the facilities are owned by the Government. Their workload is assigned as though they were organic depots.
- Approximately 6 percent of the total program was for inter-Service work, performed for the Army at other DoD or Government depots. This workload is also reported as contract work in Army budget reports.

PROGRAM TOTALS

Figure C-1 and Table C-1 show the program totals for the four MSCs included in our research. The MDMS data for AVSCOM, the Tank and Automotive Command (TACOM), the Communications and Electronics Command (CECOM), and the Missile Command (MICOM) are shown in Tables C-2 through C-5, respectively.

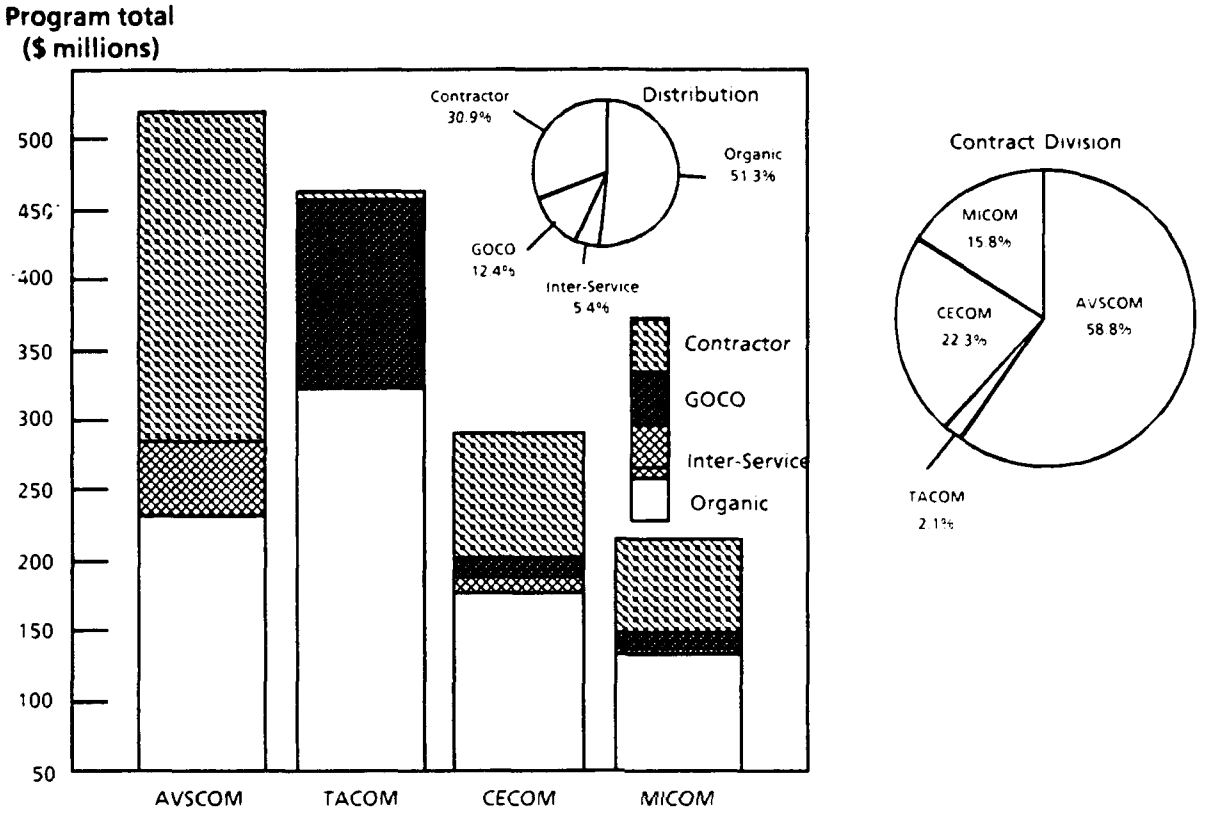

FIG. C-1. MDMS 1989 TOTALS

TABLE C-1

1989 MDMS DIRECT ARMY TOTALS

($ in thousands)

MSC	Organic	Inter-Service	GOCO/ Overseas	Contract	Total
AVSCOM	180,572	54,599	0	234,469	469,640
TACOM	272,220	0	133,761	8,479	414,460
CECOM	126,268	11,715	13,324	89,007	240,314
MICOM	82,338	3,779	12,724	66,960	165,801
Totals	661,398	70,093	159,809	398,915	1,290,215

TABLE C-2

AVSCOM MDMS DATA

Summary
($ in thousands)

	Type of item					Recoverability codes						
	PRIN	SEC	Other	Unk	Total	Blank	D	L	F	H	O	Z
Organic	40,775	131,291	7,363	1,142	180,572	40,009	137,283	266	2,990	0	22	0
Inter-Service	21,417	4,308	1,335	27,537	54,599	46,528	8,022	0	29	0	19	0
Contract	83,492	96,888	5,463	48,626	234,469	131,140	102,553	0	757	0	0	18
Totals	145,684	232,487	14,161	77,305	469,640	217,677	247,858	266	3,776	0	41	18
Essential	116,175	230,541	13,181	0	359,898	111,365	244,985	154	3,352	0	22	18
Non essential	29,509	1,946	980	0	32,436	29,006	2,873	112	424	0	19	0
Unknown	0	0	0	77,305	77,306	77,306	0	0	0	0	0	0
Totals	145,684	232,487	14,161	77,305	469,640	217,677	247,858	266	3,776	0	41	18

By system
(Values exclude GOCO)

Systems	Total contract	Percent	Contract only	Contract duo
Bulk PRONS	$48,626,470	20.7	$20,919,779	$27,706,690
UH-60 helicopter	41,185,297	17.6	16,590,460	24,594,836
U-21 aircraft	28,545,475	12.2	28,545,475	0
C-12 series aircraft	28,541,088	12.2	28,541,088	0
T63A700/720 turbine engine	25,153,169	10.7	1,039,124	24,114,044
OV-1 aircraft	18,296,504	7.8	1,527,246	16,769,258
AH-1/UH-1/OV-1 turbine engine	15,495,282	6.6	0	15,495,282
AH-64 helicopter	8,097,061	3.5	4,073,877	4,023,184
AH-1 helicopter	8,077,234	3.4	28,511	8,048,723
CH-47 helicopter	4,732,592	2.0	2,735,984	1,996,607
OH-58D	2,121,183	0.9	523,335	1,597,848
UH-1 helicopter	1,506,149	0.6	469,080	1,037,069
UH-60 turbine engine	1,263,472	0.5	0	1,263,472
AH-64 turbine engine	924,039	0.4	18,302	905,737
CH-47 turbine engine	915,000	0.4	0	915,000
OH-58D turbine engine	385,985	0.2	385,985	0
Unknown	268,574	0.1	268,574	0
Aviation support equipment	155,499	0.1	155,499	0
CH-54 helicopter	128,711	0.1	128,711	0
Manportable common thermal night sights	35,840	0.0	35,840	0
U-8 aircraft	15,231	0.0	15,231	0
OH-58A/C helicopter	1	0.0	1	0
Multiappl aviation spares	0	0.0	0	0
Totals	$234,469,856	100.0	$106,002,102	$128,467,750

Notes PRIN = Principal SEC = Secondary

TABLE C-3

TACOM MDMS DATA

Summary ($ in thousands)												
	Type of item					Recoverability codes						
	PRIN	SEC	Other	Unk	Totals	Blank	D	L	F	H	O	Z
Organic	147,831	82,859	3,446	38,083	272,220	182,526	69,450	0	593	19,645	4	0
Inter-Service	0	0	0	0	0	0	0	0	0	0	0	0
Contract (GOCO)	82,785	30,037	385	29,032	142,241 (133,761)[a]	111,772	20,577	342	698	8,849	0	0
Totals	230,616	112,896	3,831	67,115	414,461	294,298	90,027	342	1,291	28,494	4	0
Essential	230,303	105,976	3,234	0	339,514	226,869	82,917	342	1,073	28,310	0	0
Nonessential	313	6,920	597	0	7,831	313	7,110	0	218	184	4	0
Unknown	0	0	0	67,115	67,116	67,116	0	0	0	0	0	0
Totals	230,616	112,896	3,831	67,115	414,461	294,298	90,027	342	1,291	28,494	4	0

TACOM MDMS data by system (Values exclude GOCO)

Systems	Total contract	Percent	Contract only	Contract duo
Tank, 105mm, M-1/M1IP	$5,592,894	66.0	$89,865	$5,503,028
Bulk PRONS	2,064,331	24.3	1,543,686	520,644
Infantry fighting vehicle, XM2/XM3	330,000	3.9	330,000	0
High-Mobility Multipurpose Vehicle	239,552	2.8	239,552	0
Semitrailer, Prime Mover, 5 ton	201,999	2.4	0	201,999
Soil, Nuclear Test Set	44,999	0.5	44,999	0
Tank, 120mm, M-1A1	6,100	0.1	6,100	0
Total	$8,479,875	100.0	$2,254,202	$6,225,671

[a] Included in contract

Notes PRIN = Principal SEC = Secondary

TABLE C-4

CECOM MDMS DATA

Summary ($ thousands)												
	Type of item					Recoverability code						
	PRIN	SEC	Other	Unk	Total	Blank	D	L	F	H	O	Z
Organic	56,071	24,627	6,970	38,599	126,268	93,104	28,059	2,329	1,035	1,740	0	0
Inter-Service	1,251	45	0	10,418	11,715	11,157	557	0	0	0	0	0
Contract (GOCO)	11,729	576	912	89,112	102,331 (13,324)[a]	100,799	587	78	170	695	0	0
Totals	69,051	25,248	7,882	138,129	240,314	205,060	29,203	2,407	1,205	2,435	0	0
Essential	68,985	24,669	7,742	0	101,398	66,875	28,504	2,399	1,202	2,416	0	0
Nonessential	66	579	140	0	786	55	699	8	3	19	0	0
Unknown	0	0	0	138,129	138,130	138,130	0	0	0	0	0	0
Totals	69,051	25,248	7,882	138,129	240,314	205,060	29,203	2,407	1,205	2,435	0	0

By system (Values exclude GOCO)				
System	Total contract	Percent	Contract only	Contract duo
Bulk PRONS/unknown	$89,007,403	100.0	$89,007,403	$0

[a] Included in contract

Notes PRIN = Principal SEC = Secondary

TABLE C-5

MICOM MDMS DATA

Summary ($ thousands)												
	Type of item					Recoverability codes						
	PRIN	SEC	Other	Unk	Total	Blank	D	L	F	H	O	Z
Organic	45,650	24,010	1,387	11,289	82,338	55,605	25,576	51	836	268	0	0
Inter-Service	0	68	0	3,711	3,779	3,711	68	0	0	0	0	0
Contract (GOCO)	9,457	9,282	114	60,830	79,685 (12,724)[a]	69,975	9,523	19	1	165	0	0
Totals	55,107	33,360	1,501	75,830	165,802	129,291	35,167	70	837	433	0	0
Essential	54,847	33,215	1,449	0	89,514	53,200	35,019	70	787	433	0	0
Nonessential	260	145	52	0	457	260	148	0	48	0	0	0
Unknown	0	0	0	75,830	75,831	75,831	0	0	0	0	0	0
Totals	55,107	33,360	1,501	75,830	165,802	129,291	35,167	70	835	433	0	0

By system (Values exclude GOCO)				
Systems	Total contract	Percent	Contract only	Contract duo
Bulk PRONS	$56,324,887	84.1	$53,758,110	$2,566,776
FAAR radar	3,456,176	5.2	656,176	2,800,000
Hawk, Improved	3,425,753	5.1	2,055,236	1,370,516
Tow missile-vehicle	2,246,499	3.4	754,360	1,492,138
Chaparral	874,491	1.3	5,229	869,262
Warhead section, atomic	157,344	0.2	157,344	0
Hawk-Basic	138,000	0.2	0	138,000
Targets	117,086	0.2	117,086	0
Lance	75,401	0.1	75,401	0
Thermal imagery equipment	57,810	0.1	57,810	0
Stinger	44,400	0.1	44,400	0
Pershing II	22,022	0.0	22,022	0
Calibration-missiles	20,625	0.0	20,625	0
Totals	$66,960,494	100.0	$57,723,799	$9,236,692

[a] Included in contract

Note PRIN = Principal SEC = Secondary

APPENDIX D

ARMY DEPOT MAINTENANCE MOBILIZATION ISSUES

GENERAL DISCUSSION

The capacity of the peacetime organic depot base should be a function of the repair requirements during peacetime and mobilization. The optimal situation would see complete utilization of peacetime organic depot capacity and the ability to handle all required mobilization workload. The increased capacity for mobilization would come from an expanded workweek or multiple shifts, if required.

The ability of a depot to meet mobilization surge requirements is dependent upon the following factors:

- Peacetime workload
- Physical capacity of facilities
- Mobilization hiring rate
- Mobilization loss rate of employees
- Mobilization workload surge rates by work station.

Although the optimal situation may never be reached, the Army can make some adjustments to approach it. Through the process of forecasting wartime surge and comparing the results to organic capabilities, the Army can identify deficiencies and correct them.

Currently, mobilization planning for maintenance produces an unsatisfactory product in the Army. Depot Systems Command (DESCOM) prepares an annual "Posture Plan" that quantitatively evaluates the mobilization workload identified by the major subordinate commands (MSCs) with the mobilization capacity of the depots. If the mobilization forecasts were somewhat accurate, that plan would at least provide an indicator of potential problem areas. However, the mobilization forecasts are not even "somewhat" accurate.

The DESCOM posture planning applies only to the Army organic depot system. No posture planning is performed for those essential systems maintained by contractors. Furthermore, no industrial preparedness planning (IPP) is conducted with maintenance contractors, nor does the Army use mobilization/surge clauses in its maintenance contracts.

MOBILIZATION PLANNING POLICIES

Major End Items

Mobilization workload forecasts for end items should consider the following factors:

- Mission-essentiality of the end item
- Current unserviceable assets on hand
- Present CONUS population less those scheduled for deployment within 90 days
- Increased wartime operating tempo
- Availability of theater maintenance personnel
- CONUS deployment schedule
- Decreased work scope under mobilization
- Possible reactivation of displaced equipment
- Theater density (production gains and battle losses)
- Catastrophic losses versus recoverable losses
- Likelihood of battlefield recovery
- Possibility of cannibalization
- Availability of transportation from battlefield to port of embarkation
- Availability of transportation from the theater to CONUS
- Theater-to-CONUS in-transit losses
- Likelihood of increased condemnation rates during war.

The only policy and procedure for computing major end-item mobilization that we could find is in the Army Materiel Command (AMC) Mobilization Planning and Execution System (MOPES). The MOPES specifies that the MSCs will perform a manual calculation for major end items on an annual basis and provide the results to DESCOM. It considers three possible sources for mission-essential major end items:

- Returns from theater
- CONUS returns
- Current unserviceable items on hand.

Returns from Theater

The MOPES states that no returns from theater of operations are expected during the first 6 months of mobilization. During the next 6 months, only air-transportable items are expected. However, no method is given for forecasting those returns. It is not clear what rates are to be used or whether assets are accumulating during this 6-month period. The exception is those items selected for "closed-loop support." For them, returns are planned starting in Month 4. Again, the policy does not clarify what happens to the assets that may accumulate during the first 3 months.

The formula given in the MOPES assumes that in wartime, unserviceable assets will flow to the depots at a rate greater than that in peacetime because the wartime replacement factor (WARF) is higher than the peacetime replacement factor (PTRF).[1] This presumes that the wartime scenario will generate reparable assets in a manner similar to that of peacetime. The effects of battle damage and the unlikelihood of total battlefield recovery are not considered.[2] The major-end-item war reserve calculations use the same WARF but assume that every loss is a catastrophic one.

The term "closed-loop support," used during the Vietnam War, was not found in any current Army regulation, nor were any AMC or MSC personnel contacted

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[1](WARF/PTRF) x UGF = MOB UGF: where UGF is the peacetime unserviceable generation factor and MOB is mobilization. The WARF is the wartime replacement factor computed by the Concepts and Analysis Agency (CAA) and used to calculate major-end-item war reserves.

[2]The Army Material Systems Analysis Agency (AMMSA) uses end-item battlefield recovery factors as part of the secondary-item Failure Factor 3 computation. The rates vary depending on whether our forces are moving forward or retreating.

familiar with this term. Similarly, the Army provides no guidance on how to determine whether a major item is air-eligible. The air-eligible category code in the item data segment of the Army master data file applies only to secondary items. It is blank for major end items. It is not clear how a major-end-item manager is to determine whether these provisions apply.

CONUS Returns

The MOPES also gives a formula for calculating CONUS major-end-item returns during mobilization. The formula uses the total CONUS population and the PTRF. The formula fails to take into account that the CONUS population may decrease with time as units deploy. It also does not account for the likelihood of an increased operating tempo in CONUS as training is increased.

Unserviceable On-Hand Assets

The MOPES policy is to schedule unserviceable assets that are on hand on M-day in the months that they are required. This seems to be the most likely source of maintenance surge. However, the MOPES does not address the potential for reactivation of displaced items, which may be a significant portion of the wartime surge requirement.

Secondary Items

Mobilization workload forecasts for secondary items should consider the same factors as major end items. No uniform automated system for computing secondary item mobilization requirements has existed since the Commodity Command Standard System (CCSS) Application Program 682 last ran in April 1984. The MOPES currently states that "mobilization requirements for secondary items are not now being computed." On their own initiative some of the MSCs are using the War Reserve Automated Process (WRAP) to assist them in calculating secondary-item requirements.

The WRAP was designed for calculating war reserve requirements. We have identified several problems with this program that adversely impact the maintenance portion of the calculation. This in turn causes the war reserve calculation itself to be suspect. The following are possible problem areas:

- End-item monthly density validity
- Essentiality coding
- Failure Factor 2 (FF2) validity
- Maintenance task distribution (MTD) validity
- Validity of the following material management decision (MMD) file war modifiers:
  - MTD modifier
  - Repair delay time (RDT)
  - Washout rate modifier
- Inter/intra-theater losses.

End-Item Monthly Density Validity

The end-item monthly requirement and density figures are forwarded from DESCOM to the MSCs to be used in the WRAP. These figures do not account for net losses that may occur from combat damage and catastrophic loss. The assumption is that every combat loss will be immediately replaced. We believe that assumption is unrealistic and the resulting secondary-item war reserve requirements are probably too high. Further, combat damaged components and catastrophic losses do not generate unserviceable components for depot maintenance.

If the program that generates these figures accounts for the projected losses from the factors provided by CAA and the projected gains from the war reserves and the mobilized industrial base, the monthly densities would be more accurate. This procedure will reduce the calculated mobilization maintenance requirement.

If this is done, the Army must ensure that the budgetary process recognizes that the calculations are no longer based upon end-item requirements. If secondary item war reserve budgets are prepared by reducing the required funding by the difference

between end-item-funded and unfunded requirements, this methodology would have to be changed since the WRAP will already have taken this into account.

Essentiality Coding

If the essentiality of the item as interpreted from the essentiality code in the national stock number master data record (NSNMDR) is different than the essentiality shown in the provisioning master record (PMR), the item is excluded from WRAP calculation. Because of the magnitude of coding inconsistencies at one MSC that we visited, no attempt is made to review and correct the coding errors prior to the annual calculation. For that reason, many essential items may not be accounted for.

FF2 and MTD Validity

The WRAP relies heavily on FF2 (wartime replacement factor) and the MTD contained in the PMR. The MTD is the percentage of returns that will be repaired at the retail level and the depot level. Based on those percentages, the failure factor, the total population, and wartime modifiers provided by AMC, WRAP is then used to calculate expected returns from wholesale maintenance. FF2 and MTD are initially assigned at the time of provisioning by the production contractor and/or subcontractors. Policies for assigning and updating failure factors and MTDs differ at the MSCs. Generally, the FF2 assigned is usually a multiple of FF1, the peacetime replacement factor (at one MSC, FF2 is twice FF1). Many times, these failure factors are never updated on the basis of actual history. Missile Command (MICOM) has developed a program that recommends changes to the failure factors and maintenance task distributions based upon historical peacetime demand; although that program is available to all MSCs, it is not widely used. If these failure factors are not accurate, the results of mobilization workload forecasts for secondary items will be highly questionable.

The WRAP is used to calculate quantities for depot maintenance even for items that are not depot-level reparable. If the MTD has a percentage for depot repair and if other selection criteria are met, a calculation takes place. Because of this, Maintenance Data Management System (MDMS) mobilization procurement request order numbers (PRONs) have been loaded for many items that are either below depot or nonreparable based upon questionable MTDs.

Validity of Material Management Decision File War Modifiers

The MMD file contains many of the war factors that are used by the WRAP. These data are forwarded by AMC to the MSCs. Some of those war factors can vary by commodity and by theater. Three of them that affect the wholesale maintenance portion of the computation are the MTD modifier, RDT, and washout rate modifier.

The MTD modifier is used to change the percentage of unserviceable assets that are generated for repair at below-depot levels during war. If theater maintenance resources and capabilities are reduced during war (because the personnel are being used for other purposes), the MTD modifier can be used to increase the amount of depot maintenance required. The MTD modifier being used today assumes that the theater maintenance capability will continue to operate at peacetime levels. If such is not the case, the depot level workload being forecasted is understated.

The RDT is a factor that can be used for planned delays in retrograding unserviceable assets from the theater to CONUS. If personnel restrictions and/or transportation priorities will result in the accumulation of unserviceable assets for a specified period of time at the start of mobilization, this factor would be used. Today, the factor assumes no delay. If personnel or transportation cannot be immediately used for retrograding, the maintenance predictions for the early months are overstated. If, during a delay period, these items are cannibalized to get needed repair parts to support theater maintenance operations, these assets may never be available as a source for depot repair workload.

If used, the washout modifier would increase the peacetime percentage of unserviceable asset generations that are beyond repair because of war operating environmental conditions. This is also assuming no change. If such is not the case, then the forecast workload for depot maintenance is being overstated.

Inter / Intra-Theater Losses

The WRAP considers losses that enemy activity may impose on replenishment parts shipped from CONUS to theater, and within theater. The program does not, however, consider that the same enemy activity may affect the retrograde of unserviceable assets from theater to CONUS Thus, the program tends to overstate the maintenance forecast.

PROCEDURES USED AT THE MSCs

Table D-1 shows one particular major end item with mobilization workload on file at DESCOM. The item is coded as nonessential in the NSNMDR. Even if the essentiality coding is in error, the monthly schedule is highly questionable. Based upon the MOPES policy, the items scheduled as a result of battle damage will not be retrograded back to CONUS during the first 6 months. The end-item and assembly overhaul quantities are suspect because repair is more likely during mobilization because of the time frames involved. The end-item repair quantity represents a 4,350 percent increase over the 1989 program. Since this is coming from the CONUS base, these figures appear to be significantly overstated. This one item represents 37 percent of the mobilization workload at one particular Army depot.

Major End Items

Only one MSC that we visited was following the MOPES major-end-item policy. The MSCs' policies for computing major-end-item requirements are as follows:

- MSC A: Item managers followed the AMC guidance with the following assumptions: all items are consider non-closed-loop support and non-air-eligible.
- MSC B: No computation since 1985 and none scheduled.
- MSC C: 1.5 times the peacetime requirement.
- MSC D: No computation since 1985 and none scheduled.

Secondary Items

Not all the MSCs use the WRAP as an aid to forecasting maintenance requirements for secondary items. The procedures at the MSCs are as follows:

- MSCs A and B: Combine a locally developed bridge among the WRAP program, the FY85 mobilization database, personal computer (PC) applications, and manual update of MDMS>
- MSC C: 1.5 times the current peacetime program, with the largest surge (approximately one-third of the annual requirement) coming in Month 4. This was only accomplished for new items; old items have not been updated since 1986.
- MSC D: No methods are used. No updates have been made since Application Program 682 last ran.

TABLE D-1

EXAMPLE OF A MAJOR END ITEM CODED IN THE NSNMDR AS NONESSENTIAL

Work type[a]	Major item mobilization program						
	MO-1	MO-2	MO-3	MO-4	MO-5	MO-6	Totals
A1							
Quantity	26						26
Hours	91,341						91,341
IO							
Quantity	71	71	70	27	28		267
Hours	200,723	200,723	197,896	76,331	79,159		754,832
A2							
Quantity		6	8	33	41	49	137
Hours		11,959	15,945	65,773	81,718	97,663	273,058
	Major item peacetime program						
A1							(Annual)
Quantity	26						78
IO							(Annual)
Quantity							11
	Major assembly mobilization program						
A1							
Quantity	127	127	270	270	270	261	1,325
Hours	16,157	16,157	34,349	34,349	34,349	33,204	168,565
	Major assembly peacetime program						
A1							(Annual)
Quantity							1,230
	Mobilization totals						
Hours	308,221	228,839	248,190	176,453	195,226	130,867	1,287,796
	Total mobilization workload at this depot						
Hours	479,846	405,840	535,768	681,370	704,578	615,300	3,422,702

Note: This end item represents 37% of the surge workload at a depot end item IO surge = [267 – (11/6)] / (11/6) = 4,530% (6-month requirement)

[a] A1: Overhaul; A2: Battle Damage; IO: Repair

Validity of Current Data

In order to better evaluate the validity of the mobilization requirements currently being used by DESCOM for posture planning, we obtained a tape of all mobilization PRONs currently on file. By combining these data with the data used to analyze the peacetime program, we were able to stratify the total program by mission essentiality, maintenance level, and relationship to the peacetime requirement.

Table D-2 shows the percentages of the total mobilization program, both in number of PRONs and total man-years of effort, that are for items coded as nonessential and below-depot level. The table also shows that almost 56 percent of the items do not have an FY89 peacetime program.[3] The "unknown" category represents those PRONs that did not have national stock number (NSN) matches with entries in the NSNMDR and those catalog data activity (CDA) files that were used to obtain essentiality and recoverability. Only 31 percent of the program consists of essential, depot level reparables with peacetime programs.

TABLE D-2

CURRENT MOBILIZATION PROGRAM

	PRONs		Man-hours		Approx man-years
	Number	Percent of total	Number	Percent of total	
Total programs	5,004		33,736,759		16,868
Nonessential	262	5.24	3,039,717	9.01	1,520
Below depot level	602	12.03	2,030,246	6.02	1,015
Unknown	572	11.43	2,974,019	8.82	1,487
No peacetime program	2,788	55.72	15,337,715	45.46	7,668

Table D-3 shows that 67 percent of the essential items identified in the FY89 MDMS program do not have corresponding mobilization requirements on file.

[3]Some of this may be attributable to NSN changes since the programs were established. The NSNs in the MDMS tapes were all updated to the prime NSN. This information was not available for the mobilization data.

TABLE D-3

CURRENT PEACETIME PROGRAM WITHOUT MOBILIZATION

Category	Number of NSNs	Percent of total
Total essential programs	4,358	
No mobilization program	2,921	67.03

Table D-4 shows the year that each of the mobilization programs was input or last updated, and 67 percent of the programs are dated 1986 or earlier. End-item populations have changed significantly since that time as older equipments were phased out and newer items joined the inventory. Several new major weapon systems are not included at all in the mobilization database while others that are nearly obsolete are still showing 1982 requirements. Many of these older systems have been replaced by systems that have a greatly reduced depot maintenance requirement.

TABLE D-4

AGE OF MOBILIZATION PRONs

Year	PRONs	Hours
1982	54	2,046,852
1983	440	10,727,092
1984	722	5,644,834
1985	57	15,189
1986	2,004	8,593,541
1987	367	1,410,602
1988	249	2,093,174
1989	1,017	2,745,485

Even at the MSCs that had policies for conducting annual updates we found that significant portions of the file had not been updated because of manpower constraints.

POSTURE PLANNING BASED UPON MOBILIZATION REQUIREMENTS

Annually, DESCOM takes the mobilization data on file and prepares a posture plan for organic depot programs only; no posture planning of any kind is being performed for contractor items. The plan compares the peacetime capacity, the individual depot hiring plans, and the mobilization requirements by depot to determine whether problems exist. This quantitative analysis is performed at DESCOM at a summary level for an entire depot based upon the mobilization PRONs currently on file.

The procedures in AMC Regulation 750-28, *Depot Maintenance Program Scheduling, Workloading, and Reporting System*, describe a process by which each depot reviews the individual mobilization programs and informs DESCOM of capacity problems for specific workloads. Army Regulation (AR) 700-90, *Army Industrial Preparedness Program*, requires DESCOM to return the mobilization requirements that exceed in-house capability to the appropriate MSC Director for Maintenance, who then furnishes the requirement to the industrial preparedness activity. These procedures are not being followed.

No attempt is being made to analyze the requirements on a line-item basis or a work center basis. The data are not used to recommend changes in capacity or to reassign workloads to balance the mobilization requirements across depots. The MSCs are not involved in trying to find commercial repair sources for requirements that may be beyond organic capacity.

Furthermore, no one is considering the availability of spare parts that will be needed to meet the mobilization requirements. If the forecast workload is to be executed, the parts must be available. The depots must have the capability of quickly manufacturing those parts that are obsolete and must have on hand sufficient quantities of those that have long procurement and manufacturing leadtimes.

OTHER ORGANIZATIONS INVOLVED

We found many organizations within the Army that have some involvement in mobilization planning. Table D-5 summarizes the organizations involved and their responsibilities. Not all of those activities are aware that the others exist and not all have access to the data or knowledge of the assumptions that they are working with.

TABLE D-5

ARMY ORGANIZATIONS INVOLVED IN MOBILIZATION PLANNING FOR DEPOT MAINTENANCE

Activity	Function
DAMO-FDL	Responsible for approving end item replacement factors
CAA	Calculates end item replacement factors
DAMO-MOFD-Z	Responsible for end item densities by month
SIMA	Maintains end item density data and calculates end item war reserves
DALO-SMW	Provides annual war reserve guidance to AMC
AMC	Provides WRAP factors to MSCs, maintains procurement data, and the industrial preparedness planning list (IPPL)
AMSAA	Calculates secondary-item battle damage factors for WRAP
CSDA	Maintains WRAP software as part of commodity command standard system (CCSS)
LOGCEN	Models general support unit (GSU) level maintenance requirements and capacities for war
MSCs	Calculates war reserve for secondary items, sends mobilization PRONs to DESCOM
DESCOM	Prepares mobilization posture plan

Notes: DAMO-FDL = Deputy Chief of Staff for Operations and Plans, Force Development Directorate, Common Systems Division, CAA = Concepts Analysis Agency, DAMO-MOFD-Z = Deputy Chief of Staff for Operations and Plans, Force Development Directorate, Force Development Support Agency, SIMA = Systems Integration Management Agency, DALO-SMW = Deputy Chief of Staff for Logistics, Supply and Maintenance Directorate, War Reserve Division, AMC = Army Material Command, AMSAA = Army Material Systems Analysis Agency, CSDA = Computer Systems Development Activity, LOGCEN = Logistics Center, MSCs = Major Subordinate Commands, DESCOM = Depot Systems Command

The AMC personnel responsible for the WRAP program and the maintenance factors used in the calculation may be interested in the work that the Army Logistics Center (LOGCEN) is doing to predict wartime maintenance requirements at below-depot activities. Similarly, the models and assumptions used at the Office of the Deputy Chief of Staff for Operations (DCSOPS) and CAA to predict end-item attrition may be of interest to AMC mobilization planners. Similarly, the things that the Army Materiel Systems Analysis Agency (AMSAA) have considered in order to predict secondary-item battle damage may be of interest to the Office of the Deputy Chief of Staff for Logistics (ODCSLOG) and ODCS for Operations (ODCSOPS).

Since the Army needs to revalidate maintenance mobilization requirements, we recommend that knowledgeable people from all organizations that are involved in mobilization planning be brought together to discuss the policy matters and factors

that should be considered. After the Army implements new policies and develops models for forecasting requirements and after the MSCs update the mobilization file, DESCOM can use these data for the purposes for which they were intended.

APPENDIX E

DECISION CASE STUDIES

BLACKHAWK HELICOPTER

Type of procurement: Developmental

Production contract awarded: 1976

Source-of-repair selected: Interim contractor support (ICS)

Decision logic: Unknown, no documentation

Problems encountered:

- Depot maintenance plant equipment (DMPE) funding constraints; DMPE was not procured on production contract.
- Proprietary rights; some component repair has not been fully transitioned because of proprietary rights disputes.
- Lack of depot maintenance work requirements (DMWRs); some components have not completed their transition because of DMWR procurement and delivery delays.

Discussion:

Depot-level maintenance functions were managed and supported by the contractor for the first 4 years after delivery of the Blackhawk. As of April 1982, UH-60-peculiar depot items began being managed by the appropriate Major Subordinate Command (MSC). For those items for which an organic capability has not been established, the contractor's workload is set through a basic ordering agreement (BOA).

Initially, the Army planned to use organic depots for engine repair by FY82 and for airframe repair by FY83. Because of DMPE funding constraints, that schedule slipped to FY85 and FY87. Component repair transition has not been fully completed. Proprietary rights and DMWRs remain a problem.

APACHE HELICOPTER AVIONICS AND MECHANICS

Type of procurement: Developmental

Production contract awarded: 1982

Source-of-repair selected:

- Contractor life-cycle support (CLS); electronic components requiring test program sets.
- ICS; airframe and components

Decision logic: 1984 AH-64A cost comparison study approved by the Under Secretary of the Army

Problems encountered:

- DMPE funding constraints; initial funding began in FY86 and has not yet been completed. Procurements are scheduled through FY89 with final operation in FY92.
- Facility funding constraints; the mechanical component shop was funded in FY88. The hot air test facility is unfunded.
- Training funding constraints; personnel training has been funded beginning in FY89.
- Lack of DMWRs; the first DMWR contract was funded in FY87. Sixty-four DMWRs are needed for the Apache. Delivery is scheduled through 1989.
- Many engineering change proposals (ECPs); system design in flux.

Discussion:

Interim support is being provided under a BOA through FY90. Getting DMPE funded, procured, and to the depot has been a major problem. If the funding and timing are not right, the ICS period is extended. ECPs are a major obstacle to a short ICS period. For Apache, more than 200 ECPs have been generated, and the system configuration is still in flux.

TARGET ACQUISITION DESIGNATION SIGHT/ PILOT NIGHT VISION SENSOR (TADS/PNVS)

Type of procurement:	Developmental
Production contract awarded:	1982
Source-of-repair selected:	Contractor life-cycle support
Decision logic:	1984 AH-64A cost comparison study approved by the Under-Secretary of the Army
Problems encountered	None

Discussion:

The program manager's (PM) office has been very happy with the contractor's performance. Most of the items are repaired at three special repair activities (SRAs) at forward locations. The remaining items are repaired at the main facility. The technicians' pay is very high because of the skills required. The use of those SRAs has greatly improved Apache operational performance while reducing investments in spares.

Recently, a cost study was conducted to determine whether the use of organic depots for repair would be more economical. The study is being audited by the Army Audit Agency (AAA). No decision has yet been made to use organic depots for TADS/PNVS repairs.

At the time we visited the PM office, they were negotiating a new maintenance contract. They estimate that TADS/PNVS is approximately halfway through its life cycle.

CH-47 HELICOPTER MODERNIZATION

Type of procurement: Product improvement program (PIP)

Source-of-repair selected: ICS

Decision logic: Unknown, no documentation

Problems encountered:

- Lack of DMWRs; the DMWRs needed were not included in the first conversion contract.
- Delays in design and construction of test cells; originally planned for 1989, this design and construction has slipped to 1993.

MOBILE SUBSCRIBER EQUIPMENT (MSE)

Type of procurement: Nondevelopmental item (NDI)

Production contract awarded: 1985

Source-of-repair selected: Contractor life-cycle support (for MSE-unique components)

Decision logic: Cost comparison study approved by the Under Secretary of the Army

Discussion:

This is a highly controversial decision that has created a great deal of congressional interest. The Under Secretary of the Army advised Congress that the contractor repair approach was expected to provide over $8 billion in life-cycle cost avoidance.

SINGLE-CHANNEL GROUND & AIRBORNE RADIO SUBSYSTEM (SINCGARS)

Type of procurement: Developmental

Production contract awarded: 1983

Source-of-repair selected: ICS

Decision logic: Unknown, no documentation

Problems encountered:

- Many ECPs; system design in flux
- Delays in procurement of test program sets (TPS)

Discussion:

The normal 2- to 3-year development cycle was omitted and that resulted in many production problems. SINCGARS was first fielded in November 1989. The system will be under ICS until the TPSs are available. They were contracted for in October 1989.

PATRIOT MISSILE

Type of procurement: Developmental

Production contract awarded: 1981

Source-of-repair selected:

- CLS; original decision (subsequently changed)
- ICS; decision changed in 1982.

Decision logic: Unknown, no documentation

Problems encountered:

- Long development period; nearly 20 years
- Policies and attitudes changed over time
- Maintenance concept changed after production
- Integrated Logistics Support (ILS) funding constraints.

Discussion:

The original maintenance concept for the Patriot missile system was four levels, including organic depot. This four-level concept evolved to two levels (organizational remove and replace CLS for repair). The plan was to establish forward contractor facilities. Because of that plan, the Army did not buy provisioning below the module level.

In 1982, after initial fielding and provisioning, the decision was changed to three levels (organizational remove and replace, direct support for diagnostics, and organic depot). No funding was programmed for the conversion to buy provisioning, parts, technical data, TPSs, etc.

The pilot program started in June 1989. When the transition is complete, about 80 percent of the components will be repaired in organic depots; CLS will continue for about 60 items.

The PM office feels that system density, failure rates, and costs should be considered. It stated that the Patriot is a very reliable system. More than 400 depot-reparable components have never failed. They estimate that transition will cost $80 million.

FIBER-OPTIC GUIDED MISSILE (FOG-M) SYSTEM

Type of procurement: Streamlined

Production contract awarded: Future

Source-of-repair selected: Organic at first fielding (Goal); contract line for maintenance if needed.

Decision logic: Unknown, no documentation

Discussion:

The program manager's office stated that its goal is for the FOG-M system to have organic support at first fielding. First fielding is scheduled for FY93. Since this may not be possible, the production contract will contain options for depot maintenance support.

PEDESTAL-MOUNTED STINGER MISSILE (LOS-R)

Type of procurement: Nondevelopmental item

Production contract awarded: 1987

Source-of-repair selected: Interim contractor support

Decision logic: Unknown, no documentation

Problems encountered:

- Most integrated logistic support (ILS) steps were omitted prior to fielding; it was a 19-month program from solicitation to first fielding.
- Many ECPs; system design in flux.
- Lack of DMWRs.
- Lack of a transition plan; the transition plan has not yet been written.

Discussion:

The LOS-R request for proposals (RFP) was published in January 1986, the production contract was awarded in August 1987, and the system was first fielded in May 1989. The system will be maintained by the contractor until FY92 when it is scheduled for transition. The transition plan has not yet been written. The technical data package (TDP) package will not be available until 1992.

In NDI-type procurements, the design often changes as the contractor tries to meet the performance specifications. This causes many early ECPs, and the configuration changes rapidly. This rapid change then lengthens the ICS period. The procurement of technical data may also increase the ICS period. The technical data can be very expensive; sometimes the data are not available when they are of a proprietary nature.

MULTIPLE LAUNCH ROCKET SYSTEM (MLRS)

Type of procurement: Developmental

Production contract awarded: 1981

Source-of-repair selected: Interim contractor support

Decision logic: Unknown, no documentation

Problems encountered:

- DMPE procurement delays; longer leadtimes than planned. Transition was planned for 1985 but it slipped to 1988.
- Late ECPs; the improved launcher will be fielded this year.
- Intermediate forward test equipment (IFTE) utilization; the new launcher will not be organic until the FY94-to-FY95 time frame because of IFTE availability.

Discussion:

The MLRS was first fielded in 1983. The plan was to provide ICS for a 2-year period. Organic depot support began in 1988 (a 3-year delay) because of delays in getting needed DMPE.

A later plan to use the MLRS launcher for the Army Tactical Missile System (TACM) led to a major ECP. The new launcher was first fielded in January 1989. No organic support will be provided for the new launcher until the FY94-to-FY95 time frame because of IFTE-related delays.

Although the system is scheduled for considerable organic depot maintenance, the PM ultimately plans on a 50/50 split between organic repair and contractor life-cycle repair.

ARMY TACTICAL MISSILE SYSTEM (TACM)

Type of procurement: Streamlined

Production contract awarded: 1989

Source-of-repair selected: Interim contractor support

Decision logic: Unknown, no documentation

Discussion:

The TACM will be a low-density system. The production contract was awarded in March 1989 and includes a 3-year warranty. First fielding is scheduled for July 1990. The current plan is to use organic depots for maintenance with ICS, unless the plan proves uneconomical.

ADVANCED ANTITANK WEAPON SYSTEM (AAWS)

Type of procurement: Streamlined

Production contract awarded: Future

Source-of-repair selected: Organic at first fielding (planned option in contract if needed)

Decision logic: Unknown, no documentation

Problems encountered: Technical data package will not be available until after first fielding

Discussion:

The PM office expressed concern that it is being pressured to have organic support at first fielding even though the TDP will not be available in time. A warranty period will be built into the contract.

Department of Defense Directive 4151.16 states that to reduce the risk of premature investment in organic support capability, the transition to Government support normally shall be scheduled to occur after system design is stable and the capability to support a particular system or equipment end item has been demonstrated.

BRADLEY FIGHTING VEHICLE

Type of procurement: Developmental

Production contract awarded: First fielded in late 1981

Source-of-repair selected: Interim contractor support

Decision logic: Unknown

Problems encountered:

- Many ECPs; system design in flux.
- DMPE funding constraints; had difficulty getting DMPE funds.
- Capacity problems at Red River Army Depot.

Discussion:

The Bradley Fighting Vehicle was first fielded in 1981, and its transition to organic depot repair was planned for 1984. Because of DMPE funding constraints and organic depot capacity problems, the transition was deferred to mid-1985 for components and to mid-1986 for the basic vehicle.

Only the transmission remains under contractor repair.

M-1 ABRAMS TANK

Type of procurement: Streamlined

Source-of-repair selected: ICS

Decision logic: Selected organic because all tanks are organic

Problems encountered: Proprietary rights

Discussion:

The M-1 tank is now repaired in organic depots except for the forward housing matrix assembly, which is contractor-repaired pending resolution of proprietary rights.

LESSONS LEARNED

The case studies cited in this appendix offer several valuable lessons for future programs:

- Depot maintenance requirements (DMPE, DMWRs, etc.) should be identified, funded, and contracted for as early as possible. A depot maintenance support plan (DMSP), repair-level logistics support analysis (LSA), and DMWRs should always be acquired regardless of the eventual source of repair selected. These equipments do not always have to be contracted for; they are sometimes prepared in-house.

- Contracts must be clear in order to avoid proprietary rights disputes. If those disputes arise, they should be dealt with aggressively.

- Potential problems that will affect the Army's transition should be identified early, and the functional support groups involved should coordinate. The value of coordination and follow-up cannot be overstated.

- The source-of-repair decision process should be documented, and the history of key events should be maintained through the life of the system.

- Care should be taken when changing maintenance concepts after a system has been fielded and data have been procured. Such a change can be a costly practice. The cost should be considered prior to making a decision, and if the decision is to proceed, funds should be made available to implement the decision.

- The need for training should not be overlooked when planning for organic support, especially when such support involves newer technologies.

- The Army should consider the likelihood of early ECPs when planning for organic depot maintenance. An overambitious schedule for achieving organic depot support can be very costly.

- Problems in providing organic depot support are typical with electronic equipments that must use IFTE and require TPS. Waivers from using IFTE should be considered when practical.

- When cost is a factor in determining the source of repair, the cost study and analysis should be carefully documented.

APPENDIX F

DECISION TREE ANALYSIS

INTRODUCTION

This appendix discusses the Army source-of-repair decision tree logic and compares it to that of the Air Force. References used in the discussion are listed at the end of the appendix.

OSD-APPROVED DECISION TREE

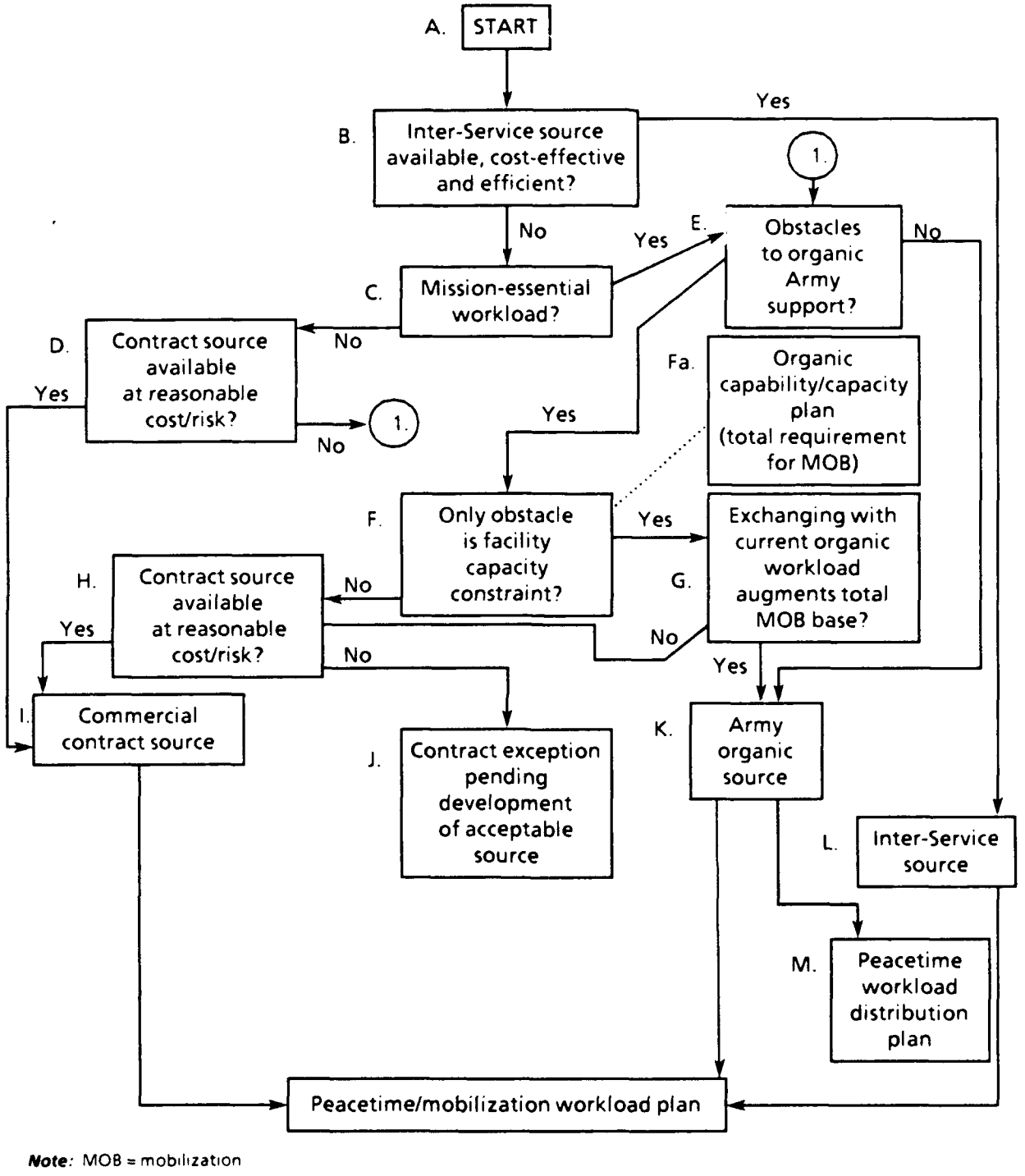
Background

The DoD Directive (DoDD) 4151.1 requires the Services to develop and implement a "decision tree" for assigning source-of-repair responsibilities (organic, inter-Service, and contract) and for determining the minimum organic resources required in peacetime to support the mobilization scenario.[F-1] The directive further states that OSD shall approve each Service's tree.

The Army-developed decision tree was forwarded to OSD for approval, and approval was received on 17 November 1983.[F-2] This tree was developed by the Depot Systems Command (DESCOM) Systems Analysis and Evaluation Office. The decision tree and instructions for its use were placed in the Army Materiel Command (AMC) Letter of Instruction (LOI).[F-3] The LOI was never officially promulgated.

General Discussion

The OSD-approved 1983 decision tree (see Figure F-1) was to be used annually or when major changes of workload distribution occur during the program execution year according to this LOI. The LOI fails to state which agency will do this evaluation of use the decision tree. From our interviews and field visits, we believe that this process has never taken place.



Note: MOB = mobilization

FIG. F-1. ARMY DECISION TREE, 1983 VERSION

Most of the personnel interviewed at the major subordinate commands (MSCs) were unaware of the decision tree. Those personnel who were aware of its existence

were asked about the usefulness and practicality of the tree. Their unanimous response was that it was unworkable; however, few solid recommendations were offered about how to make it better.

The LOI made no provisions for documenting any specific decisions made using the tree nor did it provide for any specific approval process.

Analysis of the Decision Tree

In general, we found the current decision tree logic for selecting source of repair to be sound. The few questionable areas are discussed in the following subsections.

Block A – Start

Although not specifically stated, it is implied that the decision tree is only used for the source of repair of an entire major end item. The tree does not take into account that a different decision for some of the major end items' reparable assemblies because of different circumstances.

Block C – Mission-Essential Workload?

If the Joint Maintenance Action Group (JMAG) of the Joint Logistics Commanders (JLC) assigns the Army responsibility for repairing a system, the next step is to determine the mission essentiality of the workload. The LOI references the definition of mission essentiality given in DoDD 4151.1.[F-1] The LOI further states that the Army War Reserve Stockage List (WARSL) and the Department of the Army (DA) Critical Items List (DACIL) are used to determine whether an item/system is mission essential. The WARSL has been canceled. The DACIL is production-oriented and omits many end items that are no longer in production that may still be considered critical. The result is that no clear means is available to determine whether an individual system, subsystem, or component is "mission essential."

The DoD requires that the Services manage their depot maintenance programs on the basis of mission essentiality. DoD Instruction (DoDI) 4151.15 states the following:

> To effectively implement the depot maintenance programming process, the following minimum information will be maintained at all times and on a current basis: A weapon or end item designation list that quantitatively identifies all mission essential and non-mission-essential end items in the approved inventory levels of each military department. Systems,

subsystems, and components of end items thus designated will be reflected in the same category as the end item with which they are associated.[F-4]

Since the Army does not maintain such a list, we had difficulty evaluating depot maintenance workloads by essentiality. A code in the Maintenance Data Management System (MDMS) and master file maintenance (MFM) database allows the input of a percentage of a maintenance program that is considered "mission-essential workload." AMC Regulation 750-28, paragraph 8-15, describes a process by which the Army planned to input these percentages and produce a report (RCD DRCMM-339, Mission-Essential Material Status Report).[F-5] Interviews with DESCOM personnel indicated that this process was not completed and that this paragraph will be deleted from the next revision of AMC Regulation 750-28.[F-5]

It was also difficult to determine the essentiality of secondary-item maintenance programs since no list as described above is maintained. Essentiality can only be determined from the essentiality code in the national stock number master data record (NSNMDR) of the Commodity Command Standard System (CCSS), or the provisioning master record (PMR) of the MSC.[1] Because the Army has not implemented the new DoD essentiality coding rules for secondary items required by DoDD 4140.59, nearly all secondary items were coded as essential regardless of the essentiality code of the end item in which they are used.[F-6]

The question of mission essentiality is important because the minimum organic peacetime base should be sized to meet the mission-essential mobilization requirements.

NEW ARMY DECISION TREE

Background

A revised decision tree that contains a form for documenting decisions and coordination actions and approvals was circulated in the form of a draft AMC LOI for MSC review.[F-3] The proposed decision tree is shown in Figure F-2. The same tree (minus the responsibilities section of the LOI) is also contained in Army Regulation (AR) 750-2.[F-7]

[1]Since the NSNMDR and the PMR are based on different coding systems, they may not match.

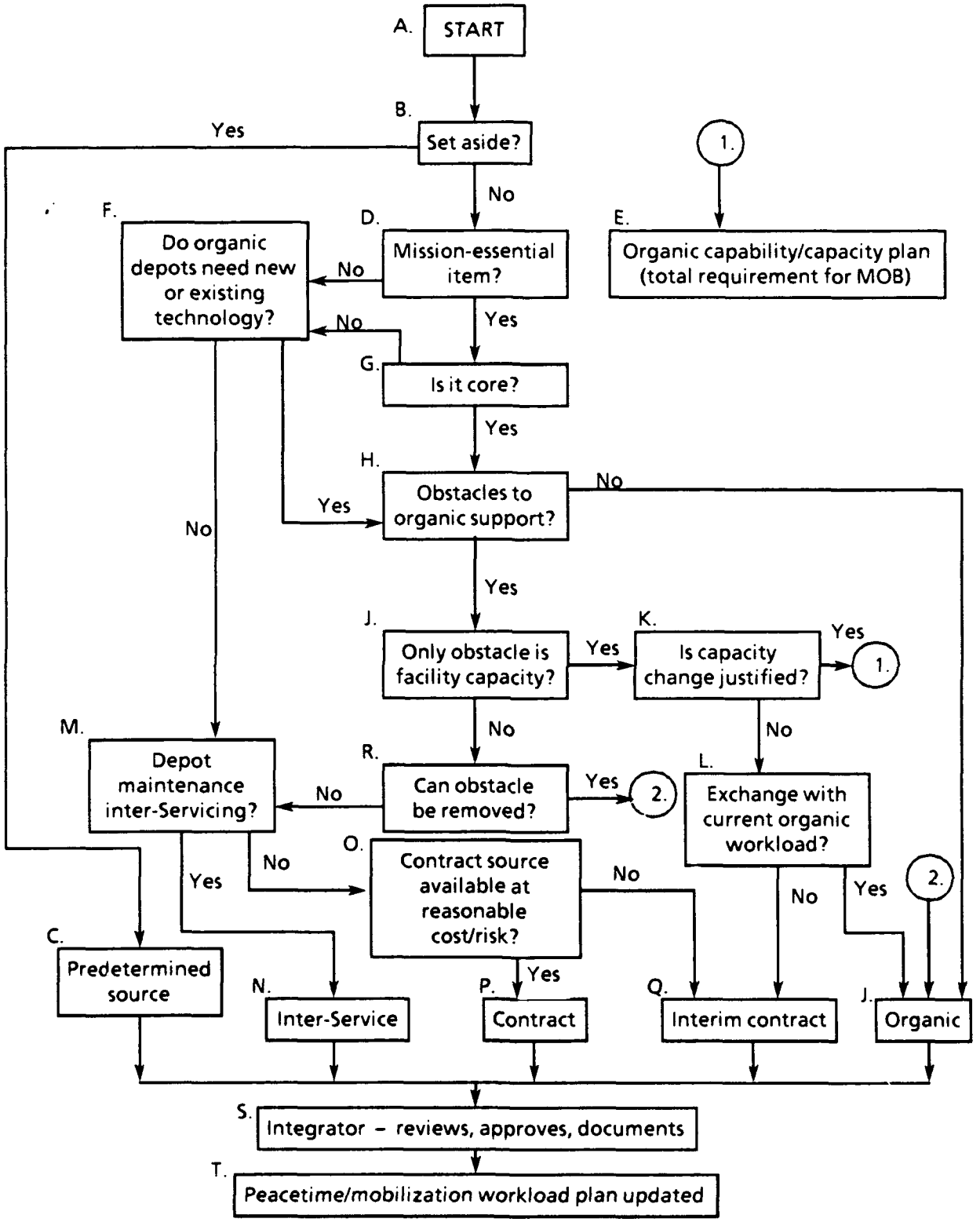


FIG. F-2. PROPOSED NEW ARMY DECISION TREE

General Discussion

The effort to provide a new decision tree has generated considerable interest at the MSCs. DESCOM initiated much of the discussion by proposing several initiatives that would give it more control over the decision process.

Although the draft AMC LOI has not been published (and probably will not be), AMC agreed that formal coordination of the source-of-repair decision with DESCOM should be required.

The draft LOI states that the program manager (PM) must do the required cost analysis at Milestone II by utilizing the cost assessment methodology of Office of Management and Budget (OMB) Circular A-76 as modified by the draft LOI.[F-8] However, the decision tree logic flow chart and narrative do not call for a cost comparison between contract and organic sources. Interviews with key personnel at the MSCs revealed a general lack of understanding as to when and how cost comparisons are to be prepared and used. The procedure has been further clouded by legislation that prohibits cost competitions between contractors and Army depots.

The draft LOI discusses source-of-repair decision responsibilities that conflict with other ARs. Specifically, it states that AMC will be the final approval authority for source-of-repair decisions. AR 750-2 states that the final determination of the source of repair, made after formal coordination, is a responsibility of the PM.[F-7] Additionally, other ARs conflict with the assignment of final source-of-repair decisions to AMC.

AR 700-127 requires the PM to develop a depot maintenance support plan (DMSP).[F-9] Decisions as to contractor support (interim or life cycle) are to be included in the plan. If interim support is selected, a transition plan (to organic depots) is also required. The completion of this task is tracked in the Army's Acquisition Management Milestone System (AMMS), a computerized status database described in Army Pamphlet 700-26.[F-10] None of these regulations addresses the use of a decision tree.

The draft LOI, as well as Appendix (2) in AR 750-2, states that AMC reviews, coordinates, and approves source decisions that are recommended by the PM.[F-3 and F-7] They ensure that the decisions are documented and action is taken to update

mobilization plans. A single organization should be responsible for balancing workload assignments across the entire industrial base.

In the past, coordination between organizations has varied widely across the commodity commands. It depends upon the working relationships that have evolved between the program executive officers/program managers (PEOs/PMs) and the MSC as well as the personalities of the personnel assigned.

Analysis of Decision Tree

The new tree (see Figure F-2) is largely the same as the old tree. It still directs mission-essential workloads to the Army organic systems. It has some significant changes; however, the old tree had inter-Service as the first check; the new tree only considers inter-Service for nonessential workloads or for essential workloads when there are obstacles to organic depot support. The new procedure seems in conflict with the requirements of AMC Regulation 750-10, which states that no weapon system, subsystem, major end item, or component will be placed in a nonsusceptible-for-inter-Servicing category without a critical review by the Joint Services, Maintenance Inter-Service Support Management Office (MISMO).[F-11]

The old tree directed all nonessential workloads to contract sources; the new tree directs nonessential workloads to organic if the organic system needs the technology (without regard to cost). This procedure seems in conflict with DoDD 4151.1, which states that all of the non-mission-essential workload requirements must be decided on the basis of economy; the timely availability of private, commercial sources; and the need to maintain a commercial industrial mobilization base.[F-1]

Other deficiencies noted are discussed in the following subsections.

Block D – Mission-Essential Item?

Block D (Figure F-2) states that for decision-making purposes, Army mission essentiality is defined as those items and components contained in the Industrial Preparedness Planning list (IPPL). The IPPL contains only production systems and excludes items that are essential but no longer in production. The IPPL should not be used to determine mission essentiality.

Block G – Is it Core?

Public Law 99-145, Section 1231, specifies the core-logistics functions subject to the contracting limitation. The functions are defined as the facilities, equipment, and Government personnel who manage and perform the depot maintenance work at the CONUS Army depots. The law excluded functions that, on the date of its enactment (8 November 1985), (1) were being performed under contract or (2) had been announced to Congress for a commercial activities contracting study as defined by OMB Circular A-76.

DoDI 4100.33 states that the core-logistics capabilities reported to Congress 29 March 1984 under the provisions of Public Law 98-525, Section 307, comprise the facilities, equipment, and management personnel at the activities listed in the report.[F-12] It further states that the work at those activities may be performed by either Government or contractor personnel, whichever is more cost-effective and that core-logistics activities shall be retained in-house unless the Secretary of Defense grants a waiver.

Block G states that the decision maker will tentatively allocate to organic sources that portion of the workload considered necessary to posture the depots to meet minimum baseline requirements and satisfy core-logistics functions. In all of our interviews at the PM organizations, we asked whether the specific system was required for core-logistics functions; no one could answer this question, nor did we expect anyone to.

Based upon our evaluation of the legislation and DoD's implementation, we conclude that core logistics should not be a decision factor in specific source-of-repair decisions. We believe that the core-logistics law simply prohibits DoD from applying the provisions of OMB Circular A-76 to the facilities listed unless a waiver is requested and granted.

Block L – Exchange with Current Organic Workload?

The narrative in Block L states that the Army will plan for its organic depot system to accomplish no more than 70 percent of the total peacetime mission-essential workload. DoD no longer imposes that requirement, which is waived upon approval of the decision tree.

AIR FORCE DECISION TREE

Background

We reviewed the Air Force decision tree shown in Figure F-3. Its logic is discussed in Air Force Regulation 66-7.[F-12] In general, the Air Force places more emphasis on costs than the Army; however, the same legislation that prohibits the Army from conducting cost competitions applies to the Air Force as well. Other differences are discussed in the following subsections.

Analysis of Decision Tree

Block 2 – Dual or Multiple Organic or Contract Repair Sources Desired?

The Air Force decision considers dual sources to be highly desirable for depot maintenance technologies and for items that are critical to the accomplishment of the primary mission of the weapon system. This redundancy provides protection against the loss of peacetime and wartime capability because of industrial accident, fire, acts of God, sabotage, or attack. Dual sources can be provided by organic facilities or by a combination of organic and contractor facilities. The Army should incorporate this procedure as an option in its decision tree.

Block 4 – Significant Advantage to Contracting?

The Air Force decision tree acknowledges that contracting sometimes offers significant advantages regardless of the essentiality or mobilization requirements. Those advantages are as follows:

- *Economic advantage:* Small density of items produced and the same production facilities can be used; proprietary rights; etc.
- *Location advantage:* The location of the repair site affects factors such as transportation time and costs and inventory levels.
- *Volume advantage:* Similar workloads offer volume advantages.

The Army should consider these advantages in the decision process.

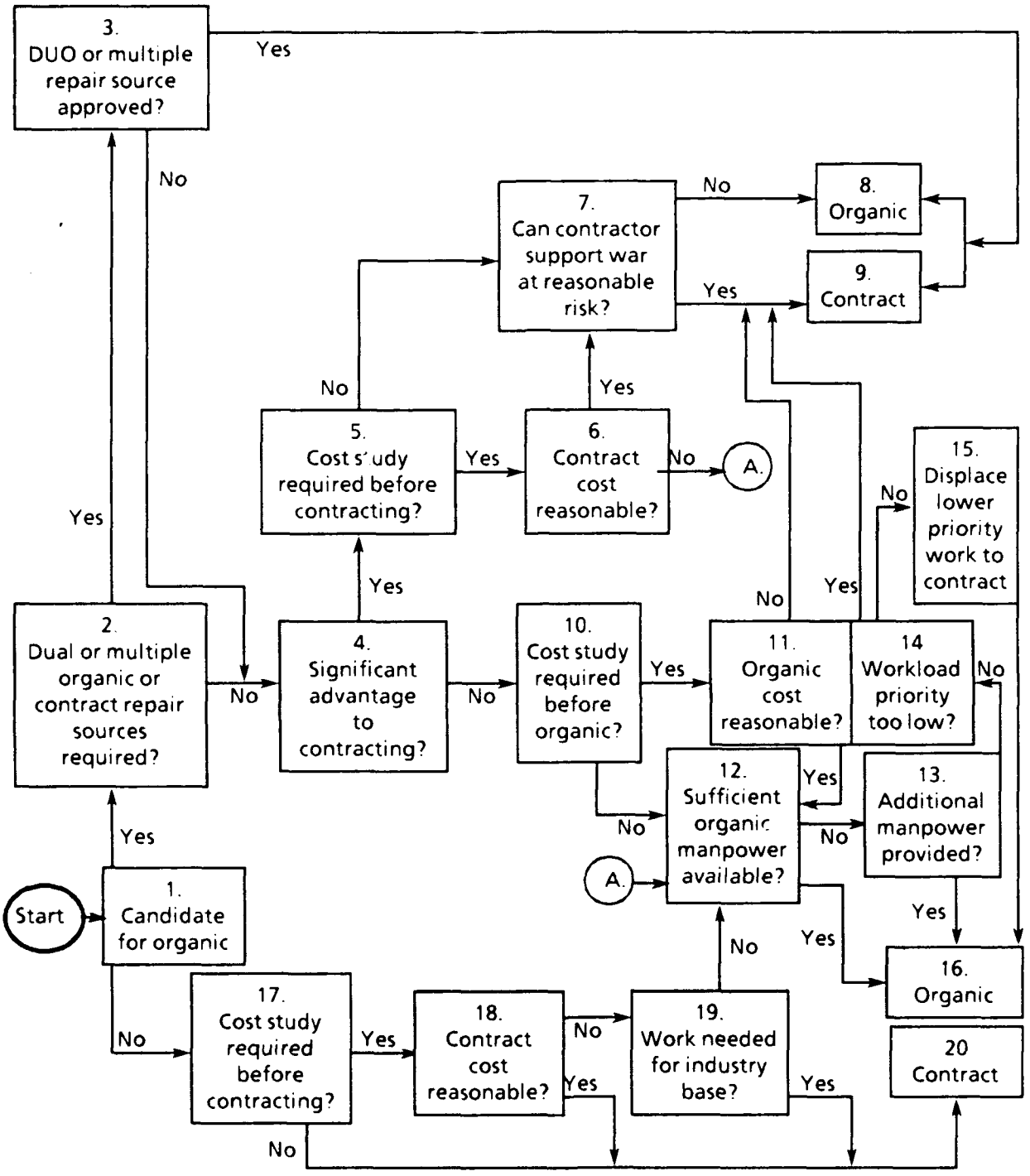


FIG. F-3. U.S. AIR FORCE DECISION TREE

Block 7 – Can Contractor [Provide] Support [During] War[time] at Reasonable Risk?

The Air Force analysis trades off potential wartime risks against peacetime cost savings. This block assesses the risks versus the benefits. In some cases, the advantages may outweigh the risks.

Block 19 – Work Needed for Industrial Production Base?

In the Air Force decision tree, a "yes" answer to the question in this block directs work to contract depots even when costs may not be reasonable so that the Air Force can maintain the industrial base for critical areas of need. The Army should consider following this procedure.

REFERENCES

[F- 1] DoD Directive 4151.1, *Use of Contractor and Government Resources for Maintenance of Material*, 15 July 1982.

[F- 2] Army DCSLOG Letter DALO-SMP-P 8351245 dated 16 November 1983.

[F- 3] AMC Decision Tree Letter of Instruction (LOI) (Undated).

[F- 4] DoD Instruction 4151.15, *Depot Maintenance Programming Policies*, 22 November 1976.

[F- 5] AMC Regulation 750-28, *Depot Maintenance Program Scheduling, Workloading, and Reporting System*, July 1982.

[F- 6] DoD Directive 4140.59, *Determination of Requirements for Secondary Items After the Demand Development Period*, 13 June 1988.

[F- 7] Army Regulation 750-2, *Army Material Maintenance, Wholesale Operations.*

[F- 8] OMB Circular A-76, *Policies for Acquiring Commercial or Industrial Products and Services Needed by the Government*, 4 August 1983.

[F- 9] Army Regulation 700-127, *Integrated Logistics Support*, 1 March 1988.

[F- 10] Army Pamphlet 700-26, *Acquisition Management Milestone System*, 22 May 1987.

[F- 11] AMC Regulation 750-10, *Depot Maintenance Inter-Service*, 26 March 1982.

[F- 12] DoD Instruction 4100.33, *Operation of Commercial and Industrial Type Activities*, 25 February 1980.

[F- 13] Air Force Regulation 66-7, *Depot Maintenance Posture Planning and Workload Management*, 23 December 1985.

APPENDIX G

DEPOT MAINTENANCE CONTRACTING OUT

INTRODUCTION

This appendix examines the depot maintenance contracting process, addressing in more detail two issues discussed in Chapter 3 – contracting methods and information requirements.

Forecasting Unserviceable Returns

Unserviceable returns forecasts are developed by the requirements determination and execution system (RD&ES), which is a composite of automated processes that determine available assets and requirements for Army-managed secondary items. Those processes result in production of an item management plan (IMP). If fewer items are projected to be available or due in from procurement or repair than the projected requirement, the IMP recommends that the inventory manager (IM) repair unserviceable assets and/or procure additional serviceable assets. The IMP forecasts the quantity of unserviceable assets that will be returned by the retail level and made available for repair. For items that are repaired by contractors, the unserviceable returns forecast provides the basis for programming depot maintenance contract quantities.

Forecast Versus Actual Returns

We reviewed IMPs and Demand, Return and Disposal (DRD) summaries dated on or about March 1986, 1987, 1988, and 1989 for 35 items managed by several Army major subordinate commands (MSCs) to assess the accuracy of unserviceable returns forecasts. Each IMP provides a monthly forecast of demands and returns for the remainder of the current fiscal year and the next 5 fiscal years. Each DRD summary identifies actual returns and demands by quarter for the current quarter and the preceding 8 quarters or 2 years. By comparing IMPs with appropriate DRD summaries for each of the 35 item IMPs, we constructed 75 data points that represent

forecast quantities of annual returns matched to their respective actual annual returns. The results of our analysis are provided in Tables G-1 through G-3.

TABLE G-1

FORECASTS EQUAL TO ACTUAL RETURNS

	A	B	C
	Forecast	Actual	Difference
1.	0	0	0
2.	4	4	0
3.	6	6	0

Table G-1 shows that 3 of the 75 forecast returns agreed precisely with the actual returns; Table G-2 shows that 36 forecast returns were greater than actual returns; and Table G-3 shows that 36 forecast returns were less than actual returns. Of those forecast returns that exceeded actual returns (Table G-2), 16 of the 36, or 44 percent, exceeded the actual returns by 100 percent or more. Of those forecasts that underestimated actual returns (Table G-3), 14 of the 36, or 39 percent, underestimated by 100 percent or more. Of those forecasts that either exceeded or underestimated actual returns, 53, or 74 percent, were off by more than 25 percent.

Tables G-1 through G-3 clearly show how inaccurate the unserviceable returns forecasts are. Those forecasts reflect the uncertainties associated with projecting Army unserviceable returns. Therefore, the Army must use contracting techniques that provide flexibility in dealing with differences between forecast and actual unserviceable returns.

CONTRACTING METHODS AND PROVISIONS

The Federal Acquisition Regulation (FAR) describes various methods of contracting and clauses and provisions that are suitable for depot maintenance contracting. It discusses three types of indefinite delivery contracting techniques – definite quantity contracts, indefinite quantity contracts, and requirements contracts. It describes options that may be used with a definite quantity contract to allow for increased quantities if unserviceable returns exceed the basic contract

TABLE G-2

FORECASTS GREATER THAN ACTUAL RETURNS

	A	B	C	C/B
	Forecast	Actual	Difference	Percent greater
1.	701	681	20	3
2.	37	35	2	6
3.	159	148	11	7
4.	141	126	15	12
5.	161	143	18	13
6.	9	8	1	13
7.	802	690	112	16
8.	139	117	22	19
9.	846	690	156	23
10.	37	29	8	28
11.	183	138	45	33
12.	1,608	1,133	475	42
13.	252	169	83	49
14.	6	4	2	50
15.	215	143	72	50
16.	8	5	3	60
17.	19	11	8	73
18.	255	138	117	85
19.	26	14	12	86
20.	29	15	14	93
21.	6	3	3	100
22.	4	2	2	100
23.	18	8	10	125
24.	19	8	11	138
25.	24	7	17	243
26.	5	1	4	400
27.	5	1	4	400
28.	8	1	7	700
29.	71	7	64	914
30.	11	1	10	1,000
31.	26	2	24	1,200
32.	60	2	58	1,900
33.	56	1	55	5,500
34.	2	0	2	Infinity
35.	3	0	3	Infinity
36.	5	0	5	Infinity

TABLE G-3

FORECASTS LESS THAN ACTUAL RETURNS

	A	B	C	C/A
	Forecast	Actual	Difference	Percent less
1.	703	713	10	1
2.	197	202	5	3
3.	192	200	8	4
4.	1,074	1,133	59	5
5.	644	681	37	6
6.	843	894	51	6
7.	1,091	1,180	89	8
8.	181	200	19	10
9.	163	197	34	21
10.	1,616	2,002	386	24
11.	1,620	2,068	448	28
12.	309	397	88	28
13.	618	795	177	29
14.	21	27	6	29
15.	148	197	49	33
16.	21	29	8	38
17.	1,348	2,068	720	53
18.	1,943	3,005	1,062	55
19.	2,019	3,135	1,114	55
20.	261	420	159	61
21.	16	27	11	69
22.	405	795	390	96
23.	8	16	8	100
24.	3	6	3	100
25.	11	23	12	109
26.	7	16	9	128
27.	408	978	570	140
28.	15	43	28	187
29.	5	23	18	360
30.	2	11	9	450
31.	4	26	22	550
32.	0	2	2	Infinity
33.	0	3	3	Infinity
34.	0	6	6	Infinity
35.	0	9	9	Infinity
36.	0	12	12	Infinity

quantity. The FAR also provides methods that can be used to extend the period of performance under depot maintenance contracts – multiyear contracting and options to extend the term of the contract.

Current Mix of Contract Types

We obtained extracts from the Military Standard Contract Administration Procedure (MILSCAP) file from four MSCs. We selected all depot maintenance contract line items [i.e., records with corresponding maintenance procurement request order numbers (PRONs) in the materiel acquisition and delivery (MAD) file] that had contract effective dates from 1 October 1987 to 31 March 1989. Keying on the ninth position of the procurement instrument identification number (PIIN), we counted the unique occurrence of contract numbers by each contract type and determined the breakout of contracts by definite quantity and indefinite quantity. We include the following types of contracts under definite quantity:

- C type contracts, which include letter contracts, contracts incorporating basic agreements, and contracts providing subsequent provisioning, but exclude indefinite-delivery-type contracts
- M type contracts, which are manual purchase orders
- P type contracts, which are automated purchase orders.

We include indefinite-delivery-type contracts ("D" type contracts) as indefinite quantity because the national inventory control points (NICPs) that use indefinite delivery contracts use indefinite-delivery, indefinite-quantity, or requirements-types contracts. We establish a separate category for basic ordering agreements (BOAs) identified with a "G" in the ninth position of the PIIN. Table G-4 reflects the data from the MILSCAP file analysis.

The MILSCAP data suggests that all NICPs use service contracts (59 percent) more extensively than any other contract instrument. While one NICP actively uses flexible-quantity-type contracting, the majority of the NICPs use contracts that specify definite quantities even though those quantities cannot be accurately forecasted.

Definite Quantity Contracts

The FAR specifies the use of definite quantity contracts when the quantity of supplies or services can be definitely determined in advance. Applied to depot

TABLE G-4

CONTRACTING METHODS USED BY ARMY NICPS

NICP	Definite quantity	Indefinite quantity	BOA	Total
A	61 (31)[a]	187 (96)	34 (20)	282 (147)
B	100 (92)	18 (17)	11 (10)	129 (119)
C	30 (9)	4 (1)	10 (0)	44 (10)
D	9 (0)	0 (0)	2 (0)	11 (0)
Total	200 (132)	209 (114)	57 (30)	466 (276)

[a] Parenthetical numbers indicate the portions of the total that are service contracts.

maintenance contracts, this type of contracting technique is appropriate when the quantity of items requiring depot maintenance is not subject to the uncertainties associated with demands and unserviceable returns. For example, a definite quantity contract may be appropriate for certain scheduled depot maintenance actions such as configuration upgrades of all or a portion of existing wholesale stocks. In this case, the quantity of items requiring depot maintenance is predetermined, and thus not dependent on demand; it is also available for depot maintenance, and thus not dependent on unserviceable returns. In a case in which the quantity of items requiring depot maintenance is definitely known in advance, a definite-quantity contract offers an advantage over an indefinite-quantity or requirements-type contract. It results in the best possible price to the Government because the contractor is in a position to determine the parts requirements for the entire contract and obtain purchase quantity discounts or production quantity efficiency. Administrative costs may also be reduced since the parts requirements can be obtained through one purchase order or work order.

In a case in which the quantity of items requiring depot maintenance is not definitely known in advance, use of a definite quantity contract poses a major disadvantage. It provides no flexibility to deal with differences between the forecast and actual unserviceable returns. If unserviceable returns are less than fixed-contract quantities, the Army is obligated to pay for the full contract quantity. If unserviceable returns exceed the fixed-contract quantity, contract administrative

leadtime must be incurred to establish additional contract coverage for the *difference*.

Indefinite-Delivery, Indefinite-Quantity Contracts

The indefinite-delivery, indefinite-quantity contract is described in the FAR, Subpart 16.5. It provides for an indefinite quantity, within stated limits, of specific supplies or services to be furnished during a fixed time period, with deliveries to be scheduled by placing orders with the contractor. It provides for firm fixed prices, fixed prices with economic price adjustment, fixed prices with prospective redetermination, or prices based on catalog or market prices.

That type of contract requires the Government to furnish, and the contractor to repair, at least a minimum quantity of an item. The minimum quantity should not exceed the amount that the Government is fairly certain to require. The contract also requires the contractor to repair additional quantities of the item if furnished by the Government up to a stated maximum. The contract may specify maximum or minimum quantities that the Government may order under each delivery order and the maximum it may order during a specific period of time.

The FAR states that an indefinite-quantity contract may be used when (1) the Government cannot predetermine, above a specified minimum, the precise quantities of supplies or services that will be required during the contract period and (2) it is inadvisable for the Government to commit itself for more than a minimum quantity.

Use of the indefinite-delivery, indefinite-quantity contract offers the Government and contractor several advantages over the definite-quantity contract when the Government cannot accurately forecast depot maintenance requirements. It provides a broader ranged contract vehicle for the contractor to repair up to a stated maximum quantity of unserviceable items the Government requires. It eliminates the need to modify contracts or award new ones to increase contract coverage unless the stated maximum is exceeded. It frees the Government of any obligation, except the stated minimum quantity, to provide a specific number of unserviceable items to the contractor. Thus, if the projected number of unserviceable item returns above the minimum quantity does not materialize, the Government does not pay for repairs that are not performed.

This type of contracting technique is limited to depot maintenance that can be fixed priced or priced on the basis of catalog or market prices. The repair price per item charged on an indefinite-delivery, indefinite-quantity contract may be higher than a definite-quantity contract for the reasons given as advantages for using a definite-quantity contract. However, the higher price would most likely be outweighed by greater costs if a definite-quantity contract is used and the contract quantity is higher or lower than actual unserviceable returns. As may be seen in Tables G-1 through G-3, since contract quantities are based on unserviceable return forecasts, they would be higher or lower than actual returns 72 out of 75 times.

Indefinite-Delivery, Requirements-Type Contracts

The indefinite-delivery, requirements-type contract is also described in the FAR Subpart 16.5. Such a contract provides for filling all the repair requirements of designated Government activities for specified items during the contract period, with deliveries to be scheduled by placing orders with the contractor. It allows the same pricing techniques permitted for indefinite-delivery, indefinite-quantity contracts.

The requirements-type contract states a realistic estimated total quantity of items to be repaired. That estimate is not a representation to the offeror or contractor that the estimated quantity will be required or ordered, nor does it guarantee that conditions affecting requirements will be stable or normal. The estimate is based on past requirements. If feasible, the contract may state the maximum number of units the contractor is obliged to repair, and it may also state a minimum estimated quantity that the Government is fairly certain to require. The contract may also specify maximum or minimum quantities the Government may order under each delivery order and the maximum it may order during a specific period of time.

The FAR states that requirements-type contracts may be used when the Government anticipates recurring requirements but cannot predetermine the precise quantities of supplies or services that designated Government activities will need during a specified period of time.

The requirements-type contract provides the same advantages over the definite-quantity contract as the indefinite-quantity contract but with even greater flexibility. Under the requirements-type contract, funds are obligated by each delivery order rather than the minimum quantity established by the indefinite delivery contract. The requirements contract does not specify a maximum quantity

unless it is feasible to do so; rather, it provides that the contractor will fill all requirements placed upon it by designated Government activities.

The requirements-type contract has the same limitations as the indefinite-quantity contract with regard to pricing techniques, and prices may be slightly higher than if a definite-quantity contract were used. An additional limitation with requirements-type contracts is that all requirements of a designated Government activity must be filled by the contractor unless the Government urgently requires delivery prior to the earliest date specified in the contract and the contractor will not accept the order. If the designated Government activity prefers to routinely use dual sources for the repair of a type of item, this type of contract is not appropriate.

Multiyear Contracting

Multiyear contracts, as defined by the FAR in Subpart 17.1, are contracts that cover more than 1 year but no more than 5 year. Each program year is budgeted and funded annually, and at the time of award, funds need only to have been appropriated for the first year. If funds are not available in succeeding years, the Government must cancel the contract. Multiyear contracts may contain a provision allowing the reimbursement of unrecovered nonrecurring costs included in prices for canceled items.

Use of multiyear contracting offers the following advantages:

- Administrative time for the annual placement and administration of contracts is reduced.
- Contractor performance has continuity, thus avoiding annual startup costs.
- Contractor quality control does not have to be recertified annually.
- Competition is increased by including companies that would not be willing to bid on lesser quantities. Increased competition results in better pricing.
- Contractors have the incentive to improve productivity by investing in state-of-the-art technology.

Multiyear contracting is permitted under the following restricted circumstances:

- It will result in reduced total costs under the contract.
- The minimum need for the item is expected to remain unchanged.

- It is reasonable to expect that funding will be requested at a level to preclude contract cancellation.
- Contract costs and cost avoidance can be realistically determined.

Multiyear contracting may be accomplished using a modified requirements contract when anticipated annual requirements, expressed as the best estimated quantity (BEQ), can be projected with reasonable certainty. Contracts are awarded as fixed price for specified supplies or services up to a designated maximum quantity with delivery orders placed as required during the multiyear period.

The MILSCAP data that we analyzed do not indicate the degree to which multiyear purchasing is being used. However, our interviews reveal that the NICP that extensively used indefinite-quantity-type contracts uses the multiyear provision that permits exercise of the contract over a 3-year period.

Options

Federal Acquisition Regulation Subpart 17.2 defines option as a unilateral right in a contract by which, for a specified time, the Government may elect to purchase additional supplies or services called for by the contract, or may elect to extend the term of the contract.

The FAR permits the use of options in recognition of the Government's need in certain service contracts for continuity of operations and of the potential cost of disrupted support if the Government agency expects to need a similar service beyond the first contract period. The FAR does not permit the use of options to increase contract quantities when an indefinite-quantity or requirements-type contract is appropriate. It identifies several additional circumstances that preclude the use of options and should be consulted before employing options in depot maintenance contracts.

Where the FAR allows options to be employed in depot maintenance contracts, their use, like multiyear contracting, reduces the administrative cost of awarding and administering contracts. The use of options may also provide the flexibility to increase contract quantities if the contractor can also repair the option quantity during the contract period applicable to the basic quantity at the same delivery rate as the basic quantity, or as otherwise mutually agreed upon. Other advantages of

multiyear contracting cannot be realized by using options since the likelihood of options being exercised is not as great.

DEPOT MAINTENANCE CONTRACTING MANAGEMENT INFORMATION SYSTEM

Unserviceable materiel originates at the retail-level maintenance facility when its repair is beyond the maintenance capability at that level. The Commodity Command Standard System (CCSS) maintains accountability of that materiel as it travels from the retail activity and is ultimately returned to an Army depot as repaired materiel. It also computes repair cycle time (RCT) from the time the materiel is received by the contractor to the time it is returned to the depot.

Notification of Unserviceable Materiel

When a retail maintenance activity has an unserviceable item to return to the wholesale level, the following process occurs:

- If the item is on the automatic return item list (ARIL), the retail activity submits a document with a document identifier code (DIC) of FTA (automatic return notification) to be processed by CCSS.
  - If the item is first returned to a depot, the FTA posts a due-in to the activity indicated on the ARIL and generates a pre-positioned materiel receipt document (PPMRD) (DIC DWA).
  - If the item is returned directly to a contractor, the due-in is not posted until the contractor receives the materiel.
- If the item is not on the ARIL, the retail activity submits a DIC FTE (report of excess materiel) to the wholesale system. Disposition instructions are furnished to the retail maintenance activity in the form of a reply document, DIC FTR. At this time, a due-in is established and a PPMRD is generated for the activity identified in the FTR reply document.

Unserviceable Materiel Returned Through a Depot to a Contractor

When unserviceable materiel is returned to an Army depot and subsequently repaired by a contractor, the following process occurs:

- The MSC processes a demand document, DIC AO__.
- The AO__ generates a material release order (MRO), DIC A5__.

- The MRO directs the depot to ship the materiel to a specific contractor and automatically generates the due-in to the contractor's routing identifier code (RIC), DIC DFZ.
- The depot's stock on hand is reduced by the quantity of materiel shipped to the contractor as identified by the materiel release confirmation document, DIC AR__.
- Upon notification of contractor receipt, the MSC manually prepares a receipt document, DIC D6Z, to record the materiel under the contractor's location code, Condition Code M, and reduce or delete the due-in.
- Concurrent with the reduction or deletion of the contractor due-in, the receipt document establishes a new due-in, DIC DFM, and a PPMRD for the storage activity to which the materiel is to be returned after repair.
- When the unserviceable materiel is repaired and received by the Army, the receiving depot submits a receipt document, DIC D6M, to the MSC.
- The receipt document deletes the due-in at the receiving depot, deletes the quantity on-hand at the contractor location, and establishes the quantity on hand at the receiving depot.

Unserviceable Materiel Returned Directly to a Contractor

When a customer returns unserviceable materiel directly to a contractor instead of to a depot, the following process occurs:

- The MSC manually inputs a receipt document, DIC DGA or D6B.
- The receipt document identifies the materiel as on hand at location RIC FR and generates a receipt document, DIC D6Z.
- The D6Z document is rejected by CCSS so that the MSC may identify the location to which the contractor should send the repaired materiel. This is done by re-entering the receipt document with the RIC of the depot that will receive the repaired materiel.
- CCSS internally generates and processes a demand document, DIC AOA.
- The AOA generates a due-in to the contractor and deletes the on hand in location RIC FR.
- When the receipt document, DIC D6Z, is reentered, it establishes the materiel as on-hand at the contractor's location and deletes the due-in to the contractor. It also establishes a due-in and generates a PPMRD to the depot identified in the D6Z document.

- When the unserviceable materiel is repaired and returned to the Army, the receiving depot submits a receipt document, DIC D6M, to the MSC.
- The receipt document deletes the due-in at the receiving depot, deletes the quantity on hand at the contractor location, and establishes the quantity on hand at the receiving depot.

The current process for reflecting direct return of materiel from the retail activity to the contractor is inefficient. Although materiel is shipped directly to the contractor, CCSS requires manual preparation of a receipt document that reflects the return of materiel to a depot so that an image of the document is generated to the Logistics Control Activity (LCA) for processing return rate statistics. That could be accomplished by the FTM document that is submitted by the retail activity to the supply source when the materiel has been released to the carrier.

CCSS then generates a D6Z document that is rejected so the MSC can determine the depot to receive the repaired materiel and reenter the D6Z with that information. CCSS could automatically determine the depot that the repaired materiel should be returned to in the same way that it does for new procurements, thus eliminating the need for CCSS to reject the D6Z transaction and the MSC to resubmit it. The FTA document could establish the due-in to the contractor as it does for depots, eliminating the need for CCSS to generate an AOA to establish that due-in. The D6Z could be inducted when the contractor receives the materiel. That will delete the due-in to the contractor and establish an on hand under the contractor RIC.

Document Control of Unserviceable Returns

The due-in that is created when the contractor receives unserviceable materiel should be closed when the depot inducts a receipt document to receive repaired materiel from the contractor. We discovered that, on occasion, receipt documents inducted by depots for repaired materiel do not match the document that created the due- in from the contractor. This mismatch occurs because materiel from repair and new procurement are shipped using a DD250 document and the depots have difficulty distinguishing whether materiel receipts are the result of new procurement or repair and return by a contractor. Consequently, repaired materiel is sometimes reflected as a receipt from new procurement, DIC D4__, rather than from repair and does not match the due-in document DIC in order to delete it. Assets will be overstated when this mistake occurs because the DIC D4 will post an increase in on-hand stock without deleting a due-in that no longer exists. In addition to overstatement of

assets, the mismatch between receipts and due-in documents creates a significant workload that involves researching edit error and transaction history data, inducting reversal documents, and submitting corrected transactions. To resolve that problem, contractors could be required to stick a label on the DD 250 that states that a D6M transaction should be used to receive the materiel.

The depot maintenance contract establishes document number control of unserviceable materiel accountability transactions between the depot and the contractor. The contract specifies that in returning repaired materiel the contractor will use the same document number that was used to ship the materiel from the depot to the contractor. Our research identified several occasions where the return quantity of repaired materiel exceeded the shipment quantity of unserviceable materiel but cited the same document number.

When such discrepancies occur, receipt and due-in records will not be matched, and again assets will be overstated. That problem can be resolved by establishing an automated contractor reporting and management system. As discussed below, such a system would track the quantity received by document number and ensure that the quantity returned under that document number is not greater than the quantity received.

Contractor Reporting and Management System

Current Procedures

When unserviceable materiel is shipped to a contractor for repair, the contractor notifies the Army that it has received the materiel by mailing a monthly report (Form 926) or a copy of the DD Form 1348-1 shipping document to the Procurement and Production (P&P) Directorate of the MSC. The report identifies cumulative quantities of materiel received, shipped, condemned, in production, awaiting parts, awaiting instructions, and on site for the contract period. It also reflects the quantity and transaction data [i.e., stock number, part number, document number, date, serial number, Department of Defense Activity Address Code (DoDAAC) shipped to, delivery order number], and item number) for receipts, shipments and condemnations during the latest period that the report covers.

The P&P Directorate provides the Form 1348-1 or the 926 Report to the Distribution and Transportation (D&T) branch for manual processing to update

inventory accountability records. With regard to inventory accountability, no further transactions are processed until the depot receives the repaired materiel and inducts a receipt document.

The current method of tracking materiel after it has been shipped to the contractor for repair has the following disadvantages: (1) it is labor-intensive, (2) it delays the posting of contractor receipts, (3) it offers many opportunities for errors, and (4) it does not provide adequate contractor inventory management information.

At one NICP, we found that most of the time of one Government Service (GS)-7 or GS-9 worker was spent in manually inputting contractor receipt transactions and ensuring corresponding due-in transactions had been deleted. In most cases, the contractor maintains its own system to account for receipts and therefore duplicates the Army's effort to update its system.

Posting of receipts based on the Form 926 reports is delayed an average of 15 days since it is a monthly report, plus the time it takes the contractor to prepare and mail it and the P&P Directorate to provide it to the D&T Branch. The delay in posting receipts based on the Form 1348-1 is shorter, consisting only of the mail and processing time, assuming the contractor returns it immediately.

The delay in posting receipts increases the chance of mismatches between receipt and due-in documents because unserviceable materiel could be repaired, returned, and received by the depot before its receipt by the contractor is posted.

Because receipts are manually posted, the chance of posting erroneous data exists. One MSC transfers data from the Form 926 report to a coding sheet, thus providing an opportunity for a coding error. A second opportunity for an error occurs when the data are manually keyed into CCSS.

The current system for maintaining accountability of materiel shipped to the contractor does not provide adequate contractor inventory management information. As previously discussed, contractor receipts are not posted in a timely way. Additionally, Sector 5 of the national stock number master data record (NSNMDR) does not identify assets that are in transit from the contractor. Consequently, IMs must communicate with contractors to obtain current information as to unserviceable inventory balances.

The Army has developed a repair parts consumption data report form to enable contractor reporting of all Government-furnished material (GFM) consumed in the repair of unserviceable materiel. Our interviews indicate this form is seldom used in depot maintenance contracts, and when it is, the data are not used to update the failure history of the unserviceable materiel.

Automated System

When the contractor receives unserviceable materiel, CCSS is designed to accept any approved communications media for notification of receipt. A contractor with a personal computer (PC) and modem can automatically transmit information to the Defense Automatic Addressing System (DAAS) using DAAS Office (DAASO) Automated Message Exchange System (DAMES) software. DAMES software installed on an IBM or IBM-compatible PC gives the contractor the ability to communicate with DAAS, sending and receiving logistics documents and narrative text through a modem using standard telephone lines. Document files produced by user programs are built into standard data-pattern-formatted communication messages for transmission. Messages containing narrative text, messages containing Military Standard Requisitioning and Issue Procedure (MILSTRIP) or Military Standard Transaction Reporting and Accounting Procedure (MILSTRAP) logistics documents, and messages containing nonstandard part number requisitions may also be built interactively at the keyboard.

In conjunction with the DAASO software that transmits and receives logistics data, the Army could develop programs (using dBASE, for example) that interact with the DAASO software to use the logistics data that are transmitted and received to maintain inventory balance files, open requisition and status files, consumption data files, daily transaction files, requisition history files, and transaction history files. Those programs could be designed with built-in edits to ensure that document numbers, national stock numbers (NSNs), quantities, etc., of transmitted information are correct before being transmitted.

An automated reporting system would require the contractor to process certain transactions to update the Army's inventory records and provide for contractor management and history files. A formatted screen would assist the contractor in providing the needed information to accomplish both purposes. The contractor would prepare transactions to show activity related to contract depot maintenance, such as

contractor receipt of unserviceable materiel. The contractor would also prepare transactions to report balances of unserviceable materiel by condition code each time an activity transaction is processed to change those balances.

The contractor would need to report five basic activity-type transactions. The first activity is the receipt of unserviceable materiel; the second involves changing condition codes to reflect the repair process (i.e., induction, condemnation, awaiting parts, awaiting inspection, and Government acceptance or rejection); the third is the return of repaired or nonrepaired materiel; the fourth is the requisitioning of Government-furnished repair parts; and the fifth and final activity is the consumption of repair parts.

The required information for each transaction is defined by MILSTRIP. Generally, the following information is required:

- DIC
- Stock number
- Unit of issue
- Document number
- RIC of the managing inventory control point (ICP)
- RIC of the contractor
- Purpose code
- Condition code from
- Condition code to
- Date of transaction.

The following additional information is required for repair part requisitions:

- Signal code
- Fund code
- Priority designation code
- Contract number.

When submitting a repair part consumption report, the following additional information is required:

- Supply source
- DoDAAC
- Report sequence number.

The transactions processed by the contractor would update records maintained by both CCSS and the contractor's PC. The stock number would be the key field for each record in the contractor's file so that the contractor would only be required to enter the stock number to pull up a desired record and perpetuate previously entered data (e.g., contractor RIC) when preparing a new transaction. The purpose of each transaction is briefly described in the following paragraphs.

Receipt of Unserviceable Materiel. A contractor who receives unserviceable materiel to be repaired would process a D6Z transaction to post the materiel in Condition Code F to the contractor's RIC. In CCSS, the transaction would also delete the due-in to the contractor and establish a due-in to the depot to which the repaired materiel will be returned.

Induction of Unserviceable Materiel. A contractor who inducts unserviceable materiel into the repair process would process a DAC transaction that transfers the inducted materiel from Condition Code F to Condition Code M.

Condemnation of Unserviceable Materiel. A contractor who determines that unserviceable materiel is not economical to repair would process a DAC transaction to transfer the condemned materiel from Condition Code F if it has not yet been inducted or Condition Code M if it has been inducted to Condition Code H.

Repair Awaiting Government-Furnished Parts. When repair of unserviceable materiel is halted because Government-furnished parts necessary for its repair are not available, the contractor would process a DAC transaction to transfer the materiel from Condition Code F if it has not yet been inducted or Condition Code M if it has been inducted to Condition Code G.

Repaired Materiel Awaiting Inspection Prior to Acceptance. Upon completion of repair, but prior to Government acceptance, the contractor would process a DAC transaction to transfer the materiel from Condition Code M to Condition Code K.

Government Acceptance of Repaired Materiel. When the Government accepts repaired materiel, the contractor would process a DAC transaction to transfer the materiel from Condition Code K to a serviceable condition code.

Government Rejection of Repaired Materiel. If the Government rejects the materiel, the contractor would process a DAC transaction to transfer the materiel from Condition Code K back to Condition Code M.

Return of Repaired or Nonrepaired Materiel. Upon returning materiel to the Government, the contractor would process a D9D transaction to reduce the quantity of materiel posted to the contractor's RIC.

Requisition for Government-Furnished Repair Parts. To submit a requisition for Government-furnished repair parts, the contractor would process an AOA transaction.

Consumption of Repair Parts. A contractor who uses repair parts to repair unserviceable materiel would process a BZE transaction to record consumption in the contractor's file. That file will be downloaded to CCSS on a periodic basis as specified by the contract.

Balance-Type Transaction. A contractor who processes a D6Z, DAC, or D9D transaction affecting the balance of assets in a particular condition code also needs to process a balance-type transaction that reports the new balance of assets for all condition codes that have been affected. The B series MILSTRAP transaction formats reserved for Army use do not currently provide for the balance type transaction that is needed. Therefore, the Army needs to develop the format for this transaction and require the following information:

- Stock number
- Unit of issue
- RIC of managing ICP
- RIC of contractor
- Total quantity in each Condition Code A through M
- Contract number.

The contractor's file would automatically maintain the balance of assets in each condition code as each activity-type transaction is processed. Whenever the asset balance in any condition code changes, the contractor's file would generate the necessary balance transaction at the close of business on the day that the balance was affected.

Because the reporting system generates the necessary transactions to update the Army's inventory and overhaul consumption data files, the contractor would no longer have to prepare special reports or mail Form 1348-1s (unless exceptions occur) to inform Army IMs of unserviceable equipment status and repair parts consumption. If the Army wishes to reconcile its inventory records with the contractor's custodial files, the required files can be downloaded from the contractor's PC using the modem connection.

The automated system eliminates manual posting of contractor receipts, thus reducing labor intensity, improving the error rate, and resulting in timely posting of receipts. Because transactions are stored in a history file, the automated system provides an audit trail for reconciliation.

The automated system has some start-up costs. It requires a PC and modem that would cost approximately $2,000 if purchased from the Government Services Administration (GSA) schedule. Approximately 150 contractors perform more than $100,000 of depot maintenance for the Army. The cost to provide each one with a PC and modem would be about $300,000. Additional costs would be incurred to maintain the PCs.

To properly implement the automated system, several tasks need to be completed. Software would have to be developed to interact with the DAMES software and provide the management files described above. That development requires the following items be developed:

- Functional system requirements specification
- Input formats
- Output formats
- Prototype software
- Production software

- Users manual
- Contractor training.

Some changes would have to be made to the CCSS to enable it to recognize the additional transactions (e.g., repair induction by contractor and return of contractor-repaired materiel) reported by the contractor.

Contract specifications would be needed to describe the requirements that would be placed on the depot maintenance contractor. The specifications need to define the reporting formats and occasions that contractors would be required to comply with.

The automated system is not economically supportable for contractors that do a low volume of repair business. For those contractors, the Form 926 report and consumption data reports could continue to be used but provided on a more-frequent basis. Notification of unserviceable item receipts could be facilitated by telephone or telefaxing Form 1348-1 receipts.

APPENDIX H

GLOSSARY

AAA	=	Army Audit Agency
AAE	=	Army Acquisition Executive
AAWS	=	Advanced Antitank Weapon System
AIF	=	Army Industrial Fund
AMC	=	Army Materiel Command
AMCR	=	Army Materiel Command Regulation
AMMS	=	Acquisition Management Milestone System
AMR	=	Average Monthly Returns
AMSAA	=	Army Materiel Systems Analysis Agency
ANAD	=	Anniston Army Depot
AR	=	Army Regulation
ARCMIS	=	Automatic Repair Cycle Measurement Information System
ARIL	=	Automatic Return Item List
ATE	=	Automatic Test Equipment
AVSCOM	=	Aviation Systems Command
BES	=	Budget Estimate Submission
BEQ	=	Best Estimated Quantity
BII	=	Basic Issue Items
BOA	=	Basic Ordering Agreement
CA	=	Commercial Activities
CAA	=	Concepts and Analysis Agency
CAVS	=	Contractor Asset Visibility System

CCAD	=	Corpus Christi Army Depot
CCSS	=	Commodity Command Standard System
CCSSOI	=	Commodity Command Standard System Operating Instruction
CDA	=	Catalog Data Activity
CECOM	=	Communications and Electronics Command
CEP	=	Civilian Employment Plan
CLS	=	Contractor Life-cycle Support
COCO	=	Contractor-owned, Contractor-operated
CONUS	=	Continental United States
CSDA	=	Computer Systems Development Activity
DA	=	Department of the Army
DAAS	=	Defense Automatic Addressing System
DAASO	=	Defense Automatic Addressing System Office
DACIL	=	Department of the Army Critical Items List
DAMES	=	DAASO Automated Message Exchange System
D&T	=	Distribution and Transportation
DCSLOG	=	Deputy Chief of Staff for Logistics
DCSOPS	=	Deputy Chief of Staff for Operations
DESCOM	=	Depot Systems Command
DIC	=	Document Identifier Code
DLR	=	Depot Level Reparable
DMDB	=	Depot Maintenance Data Bank
DMPE	=	Depot Maintenance Plant Equipment
DMR	=	Defense Management Review
DMSP	=	Depot Maintenance Support Plan
DMWR	=	Depot Maintenance Work Requirement
DoD	=	Department of Defense

DoDD	=	Department of Defense Directive
DoDAAC	=	Department of Defense Activity Address Code
DoDI	=	Department of Defense Instruction
DoDR	=	Department of Defense Regulation
DRD	=	Demand, Return and Disposal
ECP	=	Engineering Change Proposal
FAR	=	Federal Acquisition Regulations
FEMA	=	Federal Emergency Management Agency
FF1	=	Failure Factor 1
FOG-M	=	Fiber Optic Guided Missile System
GFE	=	Government-Furnished Equipment
GFM	=	Government-Furnished Material
GFP	=	Government-Furnished Property
GOCO	=	Government owned – Contractor operated
GOGO	=	Government owned – Government operated
GS	=	Government Service
GSA	=	General Services Administration
GSU	=	General Support Unit
HAC	=	House Appropriations Committee
ICP	=	Inventory Control Point
ICS	=	Interim Contractor Support
IFTE	=	Intermediate Forward Test Equipment
ILS	=	Integrated Logistics Support
ILSP	=	Integrated Logistics Support Plan
IM	=	Inventory Manager
IMP	=	Item Management Plan
IPP	=	Industrial Preparedness Planning

IPPL	=	Industrial Preparedness Planning List
JLC	=	Joint Logistics Commanders
JMAG	=	Joint Maintenance Action Group
LBAD	=	Lexington Bluegrass Army Depot
LCA	=	Logistics Control Activity
LEAD	=	Letterkenny Army Depot
LMI	=	Logistics Management Institute
LOGCEN	=	Army Logistics Center
LOI	=	Letter of Instruction
LOS-R	=	Pedestal-Mounted Stinger
LSA	=	Logistics Support Analysis
MAD	=	Materiel Acquisition and Delivery
MATDEV	=	Material Developer
MDMS	=	Maintenance Data Management System
MFM	=	Master File Maintenance
MICOM	=	Missile Command
MILSCAP	=	Military Standard Contract Administration Procedure
MILSTRIP	=	Military Standard Requisitioning and Issue Procedure
MILSTRAP	=	Military Standard Transaction Reporting and Accounting Procedure
MISMO	=	Maintenance Inter-Service Support Management Office
MLRS	=	Multiple Launch Rocket System
MMD	=	Material Management Decision
MMF	=	Military Standard Contract Administration Procedure (MILSCAP) Master File
MOPES	=	Mobilization Planning and Execution System
MRO	=	Material Release Order

MSC	=	Major Subordinate Command
MSE	=	Mobile Subscriber Equipment
MTBF	=	Mean Time Between Failures
MTD	=	Maintenance Task Distribution
MZAD	=	Mainz Army Depot
NDI	=	Non-developmental item
NICP	=	National Inventory Control Point
NIIN	=	National Item Identification Number
NMP	=	National Maintenance Point
NSN	=	National Stock Number
NSNMDR	=	National Stock Number Master Data Record
ODCSLOG	=	Office of the Deputy Chief of Staff for Logistics
ODCSOPS	=	Office of the Deputy Chief of Staff for Operations
OMA	=	Operations and Maintenance Army
OMB	=	Office of Management and Budget
OSD	=	Office of the Secretary of Defense
P&P	=	Procurement and Production
PBC	=	Program Budget Cycle
PC	=	Personal Computer
PE	=	Program Element
PEO	=	Program Executive Officer
PIIN	=	Procurement Instrument Identification Number
PM	=	Program Manager
PMR	=	Provisioning Master Record
PPMRD	=	Pre-Positioned Materiel Receipt Document
PRON	=	Procurement Request Order Number
PTRF	=	Peacetime Replacement Factor

PUAD	=	Pueblo Army Depot
PWD	=	Procurement Work Directive
RCT	=	Repair Cycle Time
RD&ES	=	Requirements Determination and Execution System
RDT	=	Repair Delay Time
RIC	=	Routing Identifier Code
RIVR	=	Retrograde Intransit Visibility Report
RLT	=	Repair Lead Time
RFP	=	Request for Proposal
RRAD	=	Red River Army Depot
SAAD	=	Sacramento Army Depot
SF	=	Standard Form
SIMA	=	Systems Integration Management Agency
SM&T	=	Supply, Maintenance, and Transportation
SOR	=	Source-of-Repair
SINCGARS	=	Single-Channel Ground & Airborne Radio Subsystem
SRA	=	Special Repair Activity
TACM	=	Army Tactical Missile System
TACOM	=	Tank and Automotive Command
TADS/PNVS	=	Target Acquisition Designation Sight/Pilot Night Vision Sensor
TDP	=	Technical Data Package
TEAD	=	Tooele Army Depot
TOAD	=	Tobyhanna Army Depot
TPS	=	Test Program Sets
UGFD	=	Unserviceable Generation Factor
UNRR	=	Unserviceable Return Ratio

WARF	=	Wartime Replacement Factor
WARSL	=	War Reserve Stockage List
WRAP	=	War Reserve Automated Process